LIST OF PUBLICATIONS

Journal Publications

Thesis Work (Published/Accepted/Under-Review)

1. **V.P. Wagh**, A. Gupta, Tribology-Based Specifications for Assessing the Production Temperatures of Asphalt Binder, **Transportation Research Record** (2024). https://doi.org/10.1177/03611981241242361.
2. **V.P. Wagh**, A. Gupta Nikhil Saboo, using tribological approach to assess production temperatures of asphalt binders, **Constuction and Building Materials** 419 (2024) 135513. https://doi.org/10.1016/j.conbuildmat.2024.135513.
3. **V.P. Wagh**, M. Sukhija, A. Gupta, Exploring the consequences of reduced aging on the performance of warm mix asphalt binders, **International Journal of Pavement Enginerring** 24 (2023). https://doi.org/10.1080/10298436.2023.2270768.
4. **V.P. Wagh**, M. Sukhija, A. Gupta, Investigation on bonding between aggregates and asphalt binder containing warm mix additives, **Constuction and Building Materials** 409 (2023) 133797. https://doi.org/10.1016/j.conbuildmat.2023.133797.
5. N. Saboo, M. Sukhija, **V.P. Wagh**, A Rational Approach for Estimation of Production Temperatures of Warm Mix Asphalt (WMA), **Indian Highways**. (Indian Roads Congr. 51 (2023) 36–50.
6. **V.P. Wagh**, N. Saboo, A. Gupta, Tribology as emerging science for warm mix technology: A review, **Constuction and Building Materials**. 359 (2022) 129445. https://doi.org/10.1016/j.conbuildmat.2022.129445.
7. M. Sukhija, **V.P. Wagh**, N. Saboo, Development of workability-based approach for assessment of production temperatures of warm mix asphalt mixtures, **Constuction**

8. **and Building Materials**.. 305 (2021) 124808. https://doi.org/10.1016/j.conbuildmat.2021.124808.
9. **V.P. Wagh**, A. Gupta, Amit Bhasin (2025), "Identification, classification and selection of warm mix additives based on workability, chemical and performance characteristics", **International Journal of Pavement Enginerring** (2025). https://doi.org/ 10.1080/10298436.2025.2493939.
10. **V.P. Wagh**, A. Gupta, (2024). Tribological insights for determining the production temperatures of polymer-modified binder containing warm mix asphalt technology. **(Journal of Material in Civil Engineering, ASCE) (Under Review).**
11. **V.P. Wagh**, A. Gupta, (2024). Comparative Assessment of Phase Angle Method and Tribological Method for Evaluating the Production Temperatures of Modified Asphalt Binders. **(Construction and Building Materials) (Under Review).**

Collaborative Explorations (Published/Accepted/Under-Review)

12. **V.P. Wagh**, S. Kumar, A. Gupta, Identifying the Suitability of Warm Mix Asphalt for Reducing the Production Temperatures of Crumb Rubber – Modified Asphalt Mixtures: Economic and Environmental Perspective, **Journal of Material in Civil Engineering** 36 (2024). https://doi.org/10.1061/JMCEE7.MTENG-17546
13. A. Kumar, A. Gupta, K. Anupam, **V.P. Wagh**, Finite element-based framework to study the response of bituminous concrete pavements under different conditions, **Constuction and Building Materials**.. 417 (2024) 135368. https://doi.org/10.1016/j.conbuildmat.2024.13536
14. N. Saboo, M. Sukhija, **V.P. Wagh**, Framework for Mix Design of Pervious Paver Blocks: A Film Thickness Index–Based Approach, **Journal of Material in Civil Engineering** 35 (2023) 1–14. https://doi.org/10.1061/(asce)mt.1943-5533.0004524.

15. J. Choudhary, G. Asthana, M. Sukhija, **V.P. Wagh**, C. Gupta, Effective utilization of waste cement concrete dust in bituminous concrete, **Proceedings of the Institution of Civil Engineers, Transport**. (2023). https://doi.org/10.1680/jtran.23.00045.
16. **Vivek Pratap Wagh**, Sadiya Shaikh, Nikhil Sonvane, Ankit Gupta, "Synergetic Effect of Filler Composition on the Performance of SMA Mixtures" **(Journal of Material in Civil Engineering, ASCE) (Under Review).**

Conferences and Book Chapters

1. **Wagh, V. P.**, & Gupta, A. (2024). Tribology-Based Specifications for Assessing the Production Temperatures of Asphalt Binder. **Transportation Research Board 103rd Annual Meeting**, Washington DC, USA.
2. **Wagh, V. P.**, & Gupta, A. (2024). Production Temperatures of Polymer Modified Binders: From Tribology Perspective. **14th International on Conference on Asphalt Pavements 2024, Montreal, Canada.**
3. **Wagh, V. P.**, & Gupta, A. "Production Temperatures of Warm Mix Modified Binders: Tribological Insights Considering Different Type of Plates". **Transportation Research Board 103rd Annual Meeting**, Washington DC, USA. **(Submitted)**

[1] S.D. Capitão, L.G. Picado-Santos, F. Martinho, Pavement engineering materials: Review on the use of warm-mix asphalt, Constr. Build. Mater. 36 (2012) 1016–1024. https://doi.org/10.1016/j.conbuildmat.2012.06.038.

[2] M.C. Rubio, G. Martínez, L. Baena, F. Moreno, Warm Mix Asphalt: An overview, J. Clean. Prod. 24 (2012) 76–84. https://doi.org/10.1016/j.jclepro.2011.11.053.

[3] M. Sukhija, N. Saboo, A comprehensive review of warm mix asphalt mixtures-laboratory to field, Constr. Build. Mater. 274 (2021) 121781. https://doi.org/10.1016/j.conbuildmat.2020.121781.

[4] N. Liu, L. Liu, M. Li, L. Sun, A comprehensive review of warm-mix asphalt mixtures: mix design, construction temperatures determination, performance and life-cycle assessment, Road Mater. Pavement Des. (2023). https://doi.org/10.1080/14680629.2023.2268194.

[5] L.P. Thives, E. Ghisi, Asphalt mixtures emission and energy consumption: A review, Renew. Sustain. Energy Rev. 72 (2017) 473–484. https://doi.org/10.1016/j.rser.2017.01.087.

[6] L. Mohammad, M. Elseifi, S. Cooper, H. Challa, P. Naidoo, Laboratory evaluation of Asphalt mixtures that contain biobinder technologies, Transp. Res. Rec. (2013) 58–65. https://doi.org/10.3141/2371-07.

[7] R. Mamat, M.R. Hainin, N.A. Hassan, N.A.A. Rahman, M.N.M. Warid, M.K. Idham, A review of performance asphalt mixtures using bio-binder as alternative binder, J. Teknol. 77 (2015) 17–20. https://doi.org/10.11113/jt.v77.6681.

[8] G. Cheraghian, A. Cannone Falchetto, Z. You, S. Chen, Y.S. Kim, J. Westerhoff, K.H. Moon, M.P. Wistuba, Warm mix asphalt technology: An up to date review, J. Clean.

Prod. 268 (2020) 122128. https://doi.org/10.1016/j.jclepro.2020.122128.

[9] M. Sukhija, N. Saboo, A comprehensive review of warm mix asphalt mixtures-laboratory to field, Constr. Build. Mater. (2020) 121781. https://doi.org/10.1016/j.conbuildmat.2020.121781.

[10] B. Kheradmand, R. Muniandy, L.T. Hua, R.B. Yunus, A. Solouki, An overview of the emerging warm mix asphalt technology, Int. J. Pavement Eng. 15 (2014) 79–94. https://doi.org/10.1080/10298436.2013.839791.

[11] R.C. West, D.E. Watson, P.A. Turner, J.R. Casola, NCHRP REPORT 648: Mixing and Compaction Temperatures of Asphalt Binders in Hot-Mix Asphalt, Transportation Research Board, Washington, DC, 2010. https://doi.org/10.17226/14367.

[12] T. Bennert, G. Reinke, W. Mogawer, K. Mooney, Assessment of workability and compactability of warm-mix asphalt, Transp. Res. Rec. (2010) 36–47. https://doi.org/10.3141/2180-05.

[13] A. Almusawi, B. Sengoz, A. Topal, Investigation of mixing and compaction temperatures of modified hot asphalt and warm mix asphalt, Period. Polytech. Civ. Eng. 65 (2021) 72–83. https://doi.org/10.3311/PPci.15118.

[14] G. Reinke, Determination of mixing and compaction temperature of pg binders using a steady shear flow test, Superpave Bind. Expert Task Gr. (2003).

[15] Ingrassia LP, X. Lu, F. Canestrari, G. Ferrotti, Tribological characterization of bituminous binders with Warm Mix Asphalt additives, Constr. Build. Mater. 172 (2018) 309–318. https://doi.org/10.1016/j.conbuildmat.2018.03.275.

[16] A.J. Hanz, H.U. Bahia, Asphalt Binder Contribution to Mixture Workability and Application of Asphalt Lubricity Test to Estimate Compactability Temperatures for Warm-Mix Asphalt, 2371 (2013) 87–95. https://doi.org/10.3141/2371-10.

[17] A.J. Hanz, A. Faheem, E. Mahmoud, H.U. Bahia, Measuring Effects of Warm-Mix

Additives Use of Newly Developed Asphalt Binder Lubricity Test for the Dynamic Shear Rheometer, Transp. Res. Rec. J. Transp. Res. Board 2180 (2010) 85–92. https://doi.org/10.3141/2180-10.

[18] F. Canestrari, L.P. Ingrassia, G. Ferrotti, X. Lu, State of the art of tribological tests for bituminous binders, Constr. Build. Mater. 157 (2017) 718–728. https://doi.org/10.1016/j.conbuildmat.2017.09.121.

[19] Bharat Bhushan, INTRODUCTION TO TRIBOLOGY, John Wiley & Sons., 2013.

[20] A.W.B. Stachowiak, Gwidon W., ENGINEERING TRIBOLOGY, Butterworth Heinemann, 2013.

[21] T. Bennert, A. Maher, R. Sauber, Influence of production temperature and aggregate moisture content on the initial performance of warm-mix asphalt, Transp. Res. Rec. (2011) 97–107. https://doi.org/10.3141/2208-13.

[22] M.S. Arefin, T. Quasem, M. Nazzal, A.R. Abbas, Y. AbuHassan, Effect of short-term and long-term ageing on dynamic modulus of foamed warm mix asphalt, Int. J. Pavement Eng. 21 (2020) 524–536. https://doi.org/10.1080/10298436.2018.1493202.

[23] Ministry of road transport and Highways, Annual Report 2021-22, New Delhi (2022).

[24] P.M. DHIR, India: an Asphalt Roads Country, Asph. Yearb. 2000 (2000) 1–2.

[25] H. Sivilevičius, Š. Šukevičius, Manufacturing technologies and dynamics of hot-mix asphalt mixture production, J. Civ. Eng. Manag. 15 (2009) 169–179. https://doi.org/10.3846/1392-3730.2009.15.169-179.

[26] Y. Kim, J. Lee, C. Baek, S. Yang, S. Kwon, Y. Suh, Performance evaluation of warm- and hot-mix asphalt mixtures based on laboratory and accelerated pavement tests, Adv. Mater. Sci. Eng. 2012 (2012). https://doi.org/10.1155/2012/901658.

[27] M. Wang, C. Wang, X. Li, S. Liu, Q. Chen, Low-pollution asphalt : Road performance , emission reduction efficacy , and modification mechanism, J. Clean. Prod. 436 (2024)

140669. https://doi.org/10.1016/j.jclepro.2024.140669.

[28] C. Wang, Q. Li, K.C.P. Wang, X. Sun, X. Wang, Emission Reduction Performance of Modified Hot Mix Asphalt Mixtures, 2017 (2017).

[29] A. Romier, M. Audeen, J. David, Y. Martineau, F. Olard, Low-energy asphalt with performance of hot-mix asphalt, Transp. Res. Rec. (2006) 101–112. https://doi.org/10.3141/1962-12.

[30] C. Gnanaseelan, M. Mujumdar, A. Kulkarni, S. Chakraborty, E. Sciences, Assessment of Climate Change over the Indian Region, 2020. https://doi.org/10.1007/978-981-15-4327-2.

[31] V. Traffic, Indian state launches Green Roads Mission for sustainable road construction, (2012) 6–11. https://www.roadtraffic-technology.com/uncategorised/newsindian-state-launches-green-roads-mission-sustainable-road-construction/.

[32] A. Behl, G. Kumar, G. Sharma, P.K. Jain, Evaluation of Field Performance of Warm-mix Asphalt Pavements in India, Procedia - Soc. Behav. Sci. 104 (2013) 158–167. https://doi.org/10.1016/j.sbspro.2013.11.108.

[33] K.L. Roja, A. Padmarekha, J.M. Krishnan, Influence of warm mix additive and loading rate on rutting of warm mix asphalt pavement, Int. J. Pavement Eng. 20 (2019) 366–381. https://doi.org/10.1080/10298436.2017.1293269.

[34] A.V. Kataware, D. Singh, Effects of Wax-Based, Chemical-Based, and Water-Based Warm-Mix Additives on Mechanical Performance of Asphalt Binders, J. Mater. Civ. Eng. 30 (2018) 04018237. https://doi.org/10.1061/(asce)mt.1943-5533.0002441.

[35] R. Kumar, N. Saboo, P. Kumar, S. Chandra, Effect of warm mix additives on creep and recovery response of conventional and polymer modified asphalt binders, Constr. Build. Mater. 138 (2017) 352–362. https://doi.org/10.1016/j.conbuildmat.2017.02.019.

[36] A. Behl, S. Chandra, A.M. Asce, Aging Characteristics of Warm-Mix Asphalt Binders,

29 (2017) 1–7. https://doi.org/10.1061/(ASCE)MT.1943-5533.0002013.

[37] A.V. Kataware, D. Singh, Effect of short-term ageing on high-temperature performance of SBS modified binder containing warm mix asphalt additives, Road Mater. Pavement Des. 21 (2020) 623–642. https://doi.org/10.1080/14680629.2018.1509804.

[38] A. V. Kataware, D. Singh, Evaluating effectiveness of WMA additives for SBS modified binder based on viscosity, Superpave PG, rutting and fatigue performance, Constr. Build. Mater. 146 (2017) 436–444. https://doi.org/10.1016/j.conbuildmat.2017.04.043.

[39] R. Kumar, S. Chandra, Warm Mix Asphalt Investigation on Public Roads - A Review, Civ. Eng. Urban Plan. An Int. J. 3 (2016) 75–86. https://doi.org/10.5121/civej.2016.3206.

[40] IRC SP 101, Guidelines for Warm Mix Asphalt, 2019.

[41] G.F. Ingrassia LP, Xiaohu Lu, Francesco Canestrari, Tribological characterization of bituminous binders with Warm Mix Asphalt additives, Constr. Build. Mater. 172 (2018) 309–318. https://doi.org/10.1016/j.conbuildmat.2018.03.275.

[42] J. D'Angelo, Eric Harm, John Bartoszek, Gaylon Baumgardner, Matthew Corrigan, Jack Cowsert, Thomas Harman, Mostafa Jamshidi, Wayne Jones, Dave Newcomb, Brian Prowell, Ron Sines, Bruce Yeaton, Warm-Mix Asphalt: European Practice, 2008. www.international.fhwa.dot.gov.

[43] P.E. Sebaaly, E.Y. Hajj, M. Piratheepan, Evaluation of selected warm mix asphalt technologies, Road Mater. Pavement Des. 16 (2015) 475–486. https://doi.org/10.1080/14680629.2015.1030825.

[44] A. Chowdhury, J.W. Button, A Review of Warm Mix Asphalt. Report 473700-00080-1., Texas Transp. Institute. 7 (2008) 75.

[45] D.Y. Lee, Treating iowa's marginal aggregates and soils by foamix process, Highw. Div. Iowa Dep. Transp. Iowa Highw. Res. Board 1 (1980) 88.

[46] O. Kristjansdottir, Warm Mix Asphalt for Cold Weather Paving, Univ. Washingt. (2006) 117.

[47] T. Gandhi, Effects of Warm Asphalt Additives on Asphalt Binder and Mixture Properties, Clemson Univ. (2008) 161. https://tigerprints.clemson.edu/all_dissertations.

[48] D. Chong, Y. Wang, K. Zhao, D. Wang, M. Oeser, Asphalt Fume Exposures by Pavement Construction Workers: Current Status and Project Cases, J. Constr. Eng. Manag. 144 (2018). https://doi.org/10.1061/(asce)co.1943-7862.0001454.

[49] A. Jamshidi, M.O. Hamzah, Z. You, Performance of Warm Mix Asphalt containing Sasobit®: State-of-the-art, Constr. Build. Mater. 38 (2013) 530–553. https://doi.org/10.1016/j.conbuildmat.2012.08.015.

[50] B.G. Koenders, D.A. Stoker, O. Larsen, D. Hardy, K.P. Wilms, Innovative process in asphalt production and application to obtain lower operating temperatures, 2nd Eurasphalt Eurobitume Congr. (2000) 830–840. http://www.eecongress.org/2000/pdfbook3/session3/Proc0088uk.pdf.

[51] M. Rashwan, Characterization of Warm Mix Asphalt (WMA) performance in different asphalt applications, Zhurnal Eksp. i Teor. Fiz. (2012) 246. http://scholar.google.com/scholar?hl=en&btnG=Search&q=intitle:No+Title#0%5Cnhttp://publications.cce.iastate.edu/handle/123456789/186.

[52] M.O. Hamzah, A. Jamshidi, Z. Shahadan, Evaluation of the potential of Sasobit® to reduce required heat energy and CO2 emission in the asphalt industry, J. Clean. Prod. 18 (2010) 1859–1865. https://doi.org/10.1016/j.jclepro.2010.08.002.

[53] G.C. Hurley, B.D. Prowell, Evaluation of Sasobit for Use in Warm Mix Asphalt, NCAT Rep. 05-06 (2005) 32.

[54] A. Behnood, A review of the warm mix asphalt (WMA) technologies: Effects on thermo-mechanical and rheological properties, J. Clean. Prod. 259 (2020).

https://doi.org/10.1016/j.jclepro.2020.120817.

[55] G. Shiva Kumar, S.N. Suresha, State of the art review on mix design and mechanical properties of warm mix asphalt, Road Mater. Pavement Des. 20 (2019) 1501–1524. https://doi.org/10.1080/14680629.2018.1473284.

[56] Martins Zaumanis, Warm Mix Aspahlt Investigation (Master of Science Thesis), Kgs. Lyngby: Technical University of Denmark in cooperation with the Danish Road Institute, Department of Civil Engineering, 2010. https://doi.org/10.13140/RG.2.1.3466.6967.

[57] M.R. Mohd Hasan, Z. You, X. Yang, A comprehensive review of theory, development, and implementation of warm mix asphalt using foaming techniques, Constr. Build. Mater. 152 (2017) 115–133. https://doi.org/10.1016/j.conbuildmat.2017.06.135.

[58] M.O. Hamzah, B. Golchin, A. Jamshidi, E. Chailleux, Evaluation of Rediset for use in warm-mix asphalt: A review of the literatures, Int. J. Pavement Eng. 16 (2015) 809–831. https://doi.org/10.1080/10298436.2014.961020.

[59] F. Xiao, V.S. Punith, B. Putman, S.N. Amirkhanian, Utilization of Foaming Technology in Warm-Mix-Asphalt Mixtures Containing Moist Aggregates, J. Mater. Civ. Eng. 23 (2011) 1328–1337. https://doi.org/10.1061/(asce)mt.1943-5533.0000297.

[60] B. Middleton, AN EVALUATION OF WARM MIX ASPHALT PRODUCED WITH THE DOUBLE BARREL GREEN PROCESS WARM MIX ASPHALT PRODUCED WITH THE DOUBLE BARREL GREEN PROCESS, (2008) 1–14.

[61] J. Wielinski, A. Hand, D.M. Rausch, Laboratory and field evaluations of foamed warm-mix asphalt projects, Transp. Res. Rec. (2009) 125–131. https://doi.org/10.3141/2126-15.

[62] M.N.M. Taher, M.Y. Aman, An overview of reclaimed asphalt pavement (RAP) materials in Warm Mix Asphalt using foaming technology, ARPN J. Eng. Appl. Sci. 11

(2016) 9874–9881.

[63] J. Nithinchary, B.P. Dhandapani, R.S. Mullapudi, Application of warm mix technology - design and performance characteristics: Review and way forward, Constr. Build. Mater. 414 (2024) 134915. https://doi.org/10.1016/j.conbuildmat.2024.134915.

[64] M.R. Mohd Hasan, Z. You, H. Yin, L. You, R. Zhang, Characterizations of foamed asphalt binders prepared using combinations of physical and chemical foaming agents, Constr. Build. Mater. 204 (2019) 94–104. https://doi.org/10.1016/j.conbuildmat.2019.01.156.

[65] S.W. Perkins, Synthesis of warm mix asphalt paving strategies for use in Montana highway construction, (2009) 209. http://trid.trb.org/view.aspx?id=914377.

[66] A. Milad, A.M. Babalghaith, A.M. Al-Sabaeei, A. Dulaimi, A. Ali, S.S. Reddy, M. Bilema, N.I.M. Yusoff, A Comparative Review of Hot and Warm Mix Asphalt Technologies from Environmental and Economic Perspectives: Towards a Sustainable Asphalt Pavement, Int. J. Environ. Res. Public Health 19 (2022). https://doi.org/10.3390/ijerph192214863.

[67] Z. Hossain, M. Zaman, E.A. O'Rear, D.H. Chen, Effectiveness of water-bearing and anti-stripping additives in warm mix asphalt technology, Int. J. Pavement Eng. 13 (2012) 424–432. https://doi.org/10.1080/10298436.2011.616588.

[68] V.S. Punith, F. Xiao, B. Putman, S.N. Amirkhanian, Effects of long-term aging on moisture sensitivity of foamed WMA mixtures containing moist aggregates, Mater. Struct. Constr. 45 (2012) 251–264. https://doi.org/10.1617/s11527-011-9763-4.

[69] A. Chowdhury, J.W. Button, A Review of Warm Mix Asphalt 5. Report Date 13. Type of Report and Period Covered Unclassified, 7 (2008). http://www.ntis.gov.

[70] F.G. Praticò, M. Giunta, M. Mistretta, T.M. Gulotta, Energy and environmental life cycle assessment of sustainable pavement materials and technologies for urban roads,

Sustain. 12 (2020). https://doi.org/10.3390/su12020704.

[71] V. Gaudefroy, F. Olard, B. Cazacliu, C. De La Roche, E. Beduneau, J.P. Antoine, Laboratory investigations of mechanical performance of foamed bitumen mixes that use half-warm aggregates, Transp. Res. Rec. (2007) 89–95. https://doi.org/10.3141/1998-11.

[72] G. Foux, Information For WMA Technology Approval – NYSDOT, (2017) 1–7.

[73] A.W. Joe Button, C. Estakhri, A. Wimsatt, A SYNTHESIS OF WARM-MIX ASPHALT 6. Performing Organization Code Project 0-5597 13. Type of Report and Period Covered Unclassified, 7 (2007).

[74] B. Middleton, R.W. Forfylow, Evaluation of warm-mix asphalt produced with the Double Barrel Green process, Transp. Res. Rec. (2009) 19–26. https://doi.org/10.3141/2126-03.

[75] M. Zaumanis, Warm Mix Asphalt, (2014). https://doi.org/10.1007/978-3-662-44719-2.

[76] P. Caputo, A.A. Abe, V. Loise, M. Porto, P. Calandra, R. Angelico, C.O. Rossi, The Role of Additives in Warm Mix Asphalt Technology: An Insight into Their Mechanisms of Improving an Emerging Technology, Nanomaterials 10 (2020). https://doi.org/10.3390/nano10061202.

[77] N. Liu, L. Liu, M. Li, L. Sun, Effects of zeolite on rheological properties of asphalt materials and asphalt-filler interaction ability, Constr. Build. Mater. 382 (2023) 131300. https://doi.org/10.1016/j.conbuildmat.2023.131300.

[78] R. Anderson, G. Baumgardner, R. May, G. Reinke, Engineering properties, emissions, and field performance of warm mix asphalt technologies, Transp. Res. Board (2008) 1–151.

[79] H. Wang, X. Liu, M. van de Ven, G. Lu, S. Erkens, A. Skarpas, Fatigue performance of long-term aged crumb rubber modified bitumen containing warm-mix additives, Constr.

Build. Mater. 239 (2020). https://doi.org/10.1016/j.conbuildmat.2019.117824.

[80] D.M. Abd, H. Al-Khalid, R. Akhtar, Nano-scale properties of warm-modified bituminous binders determined with atomic force microscopy, Road Mater. Pavement Des. 18 (2017) 189–202. https://doi.org/10.1080/14680629.2017.1304262.

[81] H.M.R.D. Silva, J.R.M. Oliveira, J. Peralta, S.E. Zoorob, Optimization of warm mix asphalts using different blends of binders and synthetic paraffin wax contents, Constr. Build. Mater. 24 (2010) 1621–1631. https://doi.org/10.1016/j.conbuildmat.2010.02.030.

[82] L. Shang, S. Wang, Y. Zhang, Y. Zhang, Pyrolyzed wax from recycled cross-linked polyethylene as warm mix asphalt (WMA) additive for SBS modified asphalt, Constr. Build. Mater. 25 (2011) 886–891. https://doi.org/10.1016/j.conbuildmat.2010.06.097.

[83] Y. Edwards, P. Redelius, Rheological effects of waxes in bitumen, Energy and Fuels 17 (2003) 511–520. https://doi.org/10.1021/ef020202b.

[84] H. Zhang, H. Zhang, H. Ding, A. Rahman, Y. Qiu, Chemical Modification of Waxes to Improve the Compatibility with Asphalt Binders, ACS Sustain. Chem. Eng. 10 (2022) 10908–10921. https://doi.org/10.1021/acssuschemeng.2c02649.

[85] I.M.U. Din, M.S. Mir, Experimental investigation of low viscosity grade binder modified with Fischer Tropsch-Paraffin wax, Int. J. Pavement Res. Technol. 14 (2021) 129–137. https://doi.org/10.1007/s42947-020-0286-7.

[86] H. Yu, Q. Chen, Y. Lin, N. Dong, Effect of wax additives on asphalt rheological behavior as road paving material, Mater. Today Commun. 37 (2023) 107044. https://doi.org/10.1016/j.mtcomm.2023.107044.

[87] S. Barbati, An evaluation of use of synthetic waxes in warm mix asphalt, Adv. Test. Charact. Bitum. Mater. (2009) 1301.

[88] S.W. Goh, Z. You, Warm Mix Asphalt using Sasobit® in Cold Region, in: Cold Reg. Eng. ASCE, 2009: pp. 288–298.

[89] H. Boerrigter, H. den Uil, H.-P. Calis, Green Diesel from Biomass via Fischer-Tropsch synthesis: New Insights in Gas Cleaning and Process Design., in: Pyrolysis Gasif. Biomass Waste, Expert Meet., 2002: pp. 1–13.

[90] A.A. Muleja, Study of the Selectivity To Light Hydrocarbons in Fischer-Tropsch Synthesis, (2016) 10–200.

[91] H. Liu, Z. Zhang, J. Xie, Z. Gui, N. Li, Y. Xu, Analysis of OMMT strengthened UV aging-resistance of Sasobit/SBS modified asphalt: Its preparation, characterization and mechanism, J. Clean. Prod. 315 (2021) 128139. https://doi.org/10.1016/j.jclepro.2021.128139.

[92] M.E. Abdullah, K.A. Zamhari, R. Buhari, S. Khatijah, A. Bakar, N. Hidayah, M. Kamaruddin, N. Nayan, M.R. Hainin, N.A. Hassan, S.A. Hassan, Warm Mix Asphalt Technology_A Review, J. Teknol. 3 (2014) 39–52.

[93] G. Craft Hurley, Evaluation of new technologies for use in warm mix asphalt, (2006) 231. https://www.semanticscholar.org/paper/Evaluation-of-New-Technologies-for-Use-in-Warm-Mix-Hurley/dbbafd735b511c4d8293fb0cf25c8f62f45b42c0.

[94] J. Liu, P. Li, Low Temperature Performance of Sasobit-Modified Warm-Mix Asphalt, J. Mater. Civ. Eng. 24 (2012) 57–63. https://doi.org/10.1061/(asce)mt.1943-5533.0000347.

[95] F. Xiao, V.S. Punith, S.N. Amirkhanian, B.J. Putman, Rheological and chemical characteristics of warm mix asphalt binders at intermediate and low performance temperatures, 868 (2013) 861–868.

[96] A. Almeida, M. Sergio, Evaluation of the potential of sasobit REDUX additive to lowerwarm-mix asphalt production temperature, Materials (Basel). 12 (2019) 1–11. https://doi.org/10.3390/ma12081285.

[97] A. Vaitkus, V. Vorobjovas, L. Žalimienė, L. Žiliūt, The research on the use of warm

mix asphalt for asphalt Pavement structures, Proc. XXVII Int. Balt. Road Conf. Riga, Latv. (2009) 24–26. https://www.researchgate.net/publication/237582194.

[98] Y. Edwards, Y. Tasdemir, U. Isacsson, Rheological effects of commercial waxes and polyphosphoric acid in bitumen 160/220 - high and medium temperature performance, Constr. Build. Mater. 21 (2007) 1899–1908. https://doi.org/10.1016/j.conbuildmat.2006.07.012.

[99] M.R. Kakar, M.O. Hamzah, J. Valentin, A review on moisture damages of hot and warm mix asphalt and related investigations, J. Clean. Prod. 99 (2015) 39–58. https://doi.org/10.1016/j.jclepro.2015.03.028.

[100] A.M. Syroezhko, M.A. Baranov, S.N. Ivanov, N. V. Maidanova, Influence of natural additives and those synthesized by the Fischer-Tropsch method on the properties of petroleum bitumen and quality of floated asphalt, Coke Chem. 54 (2011) 26–31. https://doi.org/10.3103/S1068364X11010066.

[101] F. Xiao, V.S. Punith, S.N. Amirkhanian, Effects of non-foaming WMA additives on asphalt binders at high performance temperatures, Fuel 94 (2012) 144–155. https://doi.org/10.1016/j.fuel.2011.09.017.

[102] A. Banerjee, A. De Fortier Smit, J.A. Prozzi, The effect of long-term aging on the rheology of warm mix asphalt binders, Fuel 97 (2012) 603–611. https://doi.org/10.1016/j.fuel.2012.01.072.

[103] Z. Arega, A. Bhasin, Binder Rheology and Performance in Warm Mix Asphalt. Final Report No. FHWA/TX-12/0-6591-1, Cent. Transp. Res. Univ. Texas, Austin. 7 (2012).

[104] Z. Arega, A. Bhasin, A. Motamed, F. Turner, Influence of Warm-Mix Additives and Reduced Aging on the Rheology of Asphalt Binders with Different Natural Wax Contents, J. Mater. Civ. Eng. 23 (2011) 1453–1459. https://doi.org/10.1061/(ASCE)MT.1943-5533.0000315.

[105] S. Cápayová, S. Unčík, D. Cihlářová, Experience with The Use of Warm Mix Asphalt Additives in Bitumen Binders, Slovak J. Civ. Eng. 26 (2018) 33–39. https://doi.org/10.2478/sjce-2018-0005.

[106] A. Sharma, P. Kumar, Use of Warm Mix Additives in Bituminous Layers, Int. Conf. Adv. Constr. Mater. Struct. (2018). https://www.researchgate.net/publication/325366835.

[107] X. Yang, Z. You, M.R.M. Hasan, A. Diab, H. Shao, S. Chen, D. Ge, Environmental and mechanical performance of crumb rubber modified warm mix asphalt using Evotherm, J. Clean. Prod. 159 (2017) 346–358. https://doi.org/10.1016/j.jclepro.2017.04.168.

[108] B. Hill, Performance evaluation of warm mix asphalt mixtures incorporating reclaimed asphalt pavement, 2011. https://www.ideals.illinois.edu/handle/2142/24371.

[109] J.K. Davidson, Characterization of Unmodified and SBR Latex- Modified Evotherm Warm Mix Binder, (2007).

[110] N.M. ASMAEL, M.Q. WAHEED, Performance of Chemical WMA Mixtures – A review, Int. J. Adv. Sci. Res. Eng. 06 (2020) 120–126. https://doi.org/10.31695/ijasre.2020.33684.

[111] S.W. Goh, M.R.M. Hasan, Z. You, Performances Evaluation of Cecabase® RT in Warm Mix Asphalt Technology, Procedia - Soc. Behav. Sci. 96 (2013) 2782–2790. https://doi.org/10.1016/j.sbspro.2013.08.311.

[112] L.N. Mohammad, M.M. Hassan, B. Vallabhu, M.S. Kabir, Louisiana's Experience with WMA Technologies: Mechanistic, Environmental, and Economic Analysis, J. Mater. Civ. Eng. 27 (2015). https://doi.org/10.1061/(asce)mt.1943-5533.0001143.

[113] M. Sukhija, N. Saboo, A. Pani, Economic and environmental aspects of warm mix asphalt mixtures: A comparative analysis, Transp. Res. Part D Transp. Environ. 109 (2022) 103355. https://doi.org/10.1016/j.trd.2022.103355.

[114] L. Loria, E.Y. Hajj, P.E. Sebaaly, M. Barton, S. Kass, T. Liske, Performance evaluation of asphalt mixtures with high recycled asphalt pavement content, Transp. Res. Rec. (2011) 72–81. https://doi.org/10.3141/2208-10.

[115] A. Copeland, J. D'Angelo, R. Dongré, S. Belagutti, G. Sholar, Field evaluation of high reclaimed asphalt pavement-warm-mix asphalt project in Florida: Case study, Transp. Res. Rec. (2010) 93–101. https://doi.org/10.3141/2179-11.

[116] H. Khani Sanij, P. Afkhamy Meybodi, M. Amiri Hormozaky, S.H. Hosseini, M. Olazar, Evaluation of performance and moisture sensitivity of glass-containing warm mix asphalt modified with zycothermTM as an anti-stripping additive, Constr. Build. Mater. 197 (2019) 185–194. https://doi.org/10.1016/j.conbuildmat.2018.11.190.

[117] M. Sukhija, V.P. Wagh, N. Saboo, Development of workability based approach for assessment of production temperatures of warm mix asphalt mixtures, Constr. Build. Mater. 305 (2021) 124808. https://doi.org/10.1016/j.conbuildmat.2021.124808.

[118] B. Prowell, B. Frank, L. Osborne, T. Kriech, R. West, Effects of WMA on Plant Energy and Emissions and Worker Exposures to Respirable Fumes, II (2014) 64.

[119] W. Zhao, F. Xiao, S.N. Amirkhanian, B.J. Putman, Characterization of rutting performance of warm additive modified asphalt mixtures, Constr. Build. Mater. 31 (2012) 265–272. https://doi.org/10.1016/j.conbuildmat.2011.12.101.

[120] J.R.M. Oliveira, H.M.R.D. Silva, L.P.F. Abreu, S.R.M. Fernandes, Use of a warm mix asphalt additive to reduce the production temperatures and to improve the performance of asphalt rubber mixtures, J. Clean. Prod. 41 (2013) 15–22. https://doi.org/10.1016/j.jclepro.2012.09.047.

[121] M. Sukhija, N. Saboo, A comprehensive review of warm mix asphalt mixtures-laboratory to field, Constr. Build. Mater. 274 (2021) 121781. https://doi.org/10.1016/j.conbuildmat.2020.121781.

[122] M.Z. Alavi, E.Y. Hajj, A. Hanz, H.U. Bahia, Evaluating Adhesion Properties and Moisture Damage Susceptibility of Warm-Mix Asphalts: Bitumen Bond Strength and Dynamic Modulus Ratio Tests, J. Transp. Res. Rec. 2295 (2012) 44–53. https://doi.org/10.3141/2295-06.

[123] M.S. Medeiros, J.S. Daniel, H.L. Bolton, W.C. Meagher, Evaluation of moisture and low-temperature cracking susceptibility of warm-mixture asphalt, Int. J. Pavement Eng. 13 (2012) 395–400. https://doi.org/10.1080/10298436.2011.582113.

[124] Z. Hasan, B. Hamid, I. Amir, N. Danial, Long term performance of warm mix asphalt versus hot mix asphalt, J. Cent. South Univ. 20 (2013) 256–266. https://doi.org/10.1007/s11771-013-1483-1.

[125] Y. Yildirim, M. Solaimanian, T.W. Kennedy, Report No. 1250-5: Mixing and Compaction Temperatures for Hot Mix Asphalt Concrete, Austin, 2000.

[126] and L.F.R. Bahri, Gandharv Raj, Effects of Asphalt Viscosity on Physical Properties of Asphaltic Concrete, Highw. Res. Rec. (1965) 59–83.

[127] A.M. Rodríguez-Alloza, J. Gallego, Volumetric characteristics and compactability of asphalt rubber mixtures with organic warm mix asphalt additives, Mater. Constr. 67 (2017) 1–10. https://doi.org/10.3989/mc.2017.03616.

[128] Factors Affecting Compaction of Asphalt Pavements, Transp. Res. Circ. E-C105 ISSN 0097- (2006). https://doi.org/10.17226/23282.

[129] M. Sarnowski, K.J. Kowalski, J.B. Król, P. Radziszewski, Influence of overheating phenomenon on bitumen and asphalt mixture properties, Materials (Basel). 12 (2019). https://doi.org/10.3390/ma12040610.

[130] G. Cheraghian, M.P. Wistuba, Effect of fumed silica nanoparticles on ultraviolet aging resistance of bitumen, Nanomaterials 11 (2021) 1–18. https://doi.org/10.3390/nano11020454.

[131] L. Mo, X. Li, X. Fang, M. Huurman, S. Wu, Laboratory investigation of compaction characteristics and performance of warm mix asphalt containing chemical additives, Constr. Build. Mater. 37 (2012) 239–247. https://doi.org/10.1016/j.conbuildmat.2012.07.074.

[132] Y. Yildirim, J. Ideker, D. Hazlett, Evaluation of viscosity values for mixing and compaction temperatures, J. Mater. Civ. Eng. 18 (2006) 545–553. https://doi.org/10.1061/(ASCE)0899-1561(2006)18:4(545).

[133] ASTM D2493 / D2493M - 16 Standard Practice for Viscosity-Temperature Chart for Asphalt Binders, ASTM Int. (2017). https://doi.org/10.1520/D2493_D2493M-16.

[134] A.T. Ali Almusawi, Burak Sengoz, Investigation of Mixing and Compaction Temperatures of Modified Hot Asphalt and Warm Mix Asphalt, Period. Polytech. Civ. Eng. 65 (2021) 72–83. https://doi.org/10.1023/A:1009767812821.

[135] H. Wang, X. Liu, P. Apostolidis, T. Scarpas, Non-Newtonian behaviors of crumb rubber-modified bituminous binders, Appl. Sci. 8 (2018). https://doi.org/10.3390/app8101760.

[136] K.A. Ghuzlan, M.O. Al Assi, Sasobit-modified asphalt binder rheology, J. Mater. Civ. Eng. 29 (2017) 1–7. https://doi.org/10.1061/(ASCE)MT.1943-5533.0001996.

[137] Z. Chen, H. Zhang, H. Duan, C. Shi, Improvement of thermal and optical responses of short-term aged thermochromic asphalt binder by warm-mix asphalt technology, J. Clean. Prod. 279 (2021) 123675. https://doi.org/10.1016/J.JCLEPRO.2020.123675.

[138] N. Saboo, P. Kumar, Study of flow behavior for predicting mixing temperature of bitumen, Constr. Build. Mater. 87 (2015) 38–44. https://doi.org/10.1016/j.conbuildmat.2015.04.001.

[139] N. Saboo, P. Kumar, Use of flow properties for rheological modeling of bitumen, Int. J. Pavement Res. Technol. 9 (2016) 63–72. https://doi.org/10.1016/j.ijprt.2016.01.005.

[140] Asphalt Institute, MS-2, Asphalt Mix Design Methods, 7th Editio, Asphalt Institute, USA, 2014.

[141] A. Khatri, H.U. Bahia, D. Hanson, Mixing and compaction temperatures for modified binders using the superpave gyratory compactor (with discussion), J. Assoc. Asph. Paving Technol. 70 (2001) 368–402.

[142] H.U. Bahia, D.I. Hanson, M. Zeng, H. Zhai, M.A. Khatri, R.M. Anderson, NCHRP Report 459 - Characterization of Modified Asphalt Binder in Superpave Mix Design, Washington DC, 2001.

[143] S.A. Kumar, U. Sarvanan, J.M. Krishnan, A. Veeraragavan, Rheological characterisation of modified binders at mixing and compaction temperature, Int. J. Pavement Eng. 15 (2014) 767–785. https://doi.org/10.1080/10298436.2013.851792.

[144] D.E. Watson, R.C. West, P.A. Turner, J.R. Casola, Mixing and Compaction Temperatures of Asphalt Binders in Hot-Mix Asphalt, 2010. https://doi.org/10.17226/14367.

[145] A. Stimilli, A. Virgili, F. Canestrari, Warm recycling of flexible pavements: Effectiveness of Warm Mix Asphalt additives on modified bitumen and mixture performance, J. Clean. Prod. 156 (2017) 911–922. https://doi.org/10.1016/j.jclepro.2017.03.235.

[146] M.M. Cross, Rheology of non-Newtonian fluids: A new flow equation for pseudoplastic systems, J. Colloid Sci. 20 (1965) 417–437. https://doi.org/10.1016/0095-8522(65)90022-X.

[147] C. Wang, P. Hao, F. Ruan, X. Zhang, S. Adhikari, Determination of the production temperature of warm mix asphalt by workability test, Constr. Build. Mater. 48 (2013) 1165–1170. https://doi.org/10.1016/j.conbuildmat.2013.07.097.

[148] J.M. Gudimettla, L.A. Cooley, E.R. Brown, Workability of Hot Mix, Natl. Cent. Asph.

Technol. Rep. (2003).

[149] G. Zhao, P. Guo, Energy Procedia Workability of Sasobit Warm Mixture Asphalt, (2012). https://doi.org/10.1016/j.egypro.2012.01.196.

[150] A. Ali, A. Abbas, M. Nazzal, A. Alhasan, A. Roy, D. Powers, Workability Evaluation of Foamed Warm-Mix Asphalt, J. Mater. Civ. Eng. 26 (2014) 1–6. https://doi.org/10.1061/(asce)mt.1943-5533.0000904.

[151] N. Poeran, B. Sluer, Workability of asphalt mixtures, (2017). https://doi.org/10.14311/ee.2016.057.

[152] S. Mohamed, K. Abdelgalil, M. Yusof, A. Rahman, A. Arshad, Development of Workability Measuring Device for Asphalt Mixture Using Electronic Transducer and Temperature Regulator, 1 (2011) 721–726.

[153] S. Dessouky, A. Pothuganti, L.F. Walubita, D. Rand, Laboratory Evaluation of the Workability and Compactability of Asphaltic Materials prior to Road Construction, J. Mater. Civ. Eng. 25 (2013) 810–818. https://doi.org/10.1061/(asce)mt.1943-5533.0000551.

[154] H. Yu, Z. Leng, Z. Dong, Z. Tan, F. Guo, J. Yan, Workability and mechanical property characterization of asphalt rubber mixtures modified with various warm mix asphalt additives, Constr. Build. Mater. 175 (2018) 392–401. https://doi.org/10.1016/j.conbuildmat.2018.04.218.

[155] A. Kusam, H. Malladi, A.A. Tayebali, N.P. Khosla, Laboratory Evaluation of Workability and Moisture Susceptibility of Warm-Mix Asphalt Mixtures Containing Recycled Asphalt Pavements, 29 (2017) 1–8. https://doi.org/10.1061/(ASCE)MT.1943-5533.0001825.

[156] B.D. Prowell, G.C. Hurley, Warm-Mix Asphalt : Best Practices 3rd Edition, National Asphalt Pavement Association, 2007.

[157] EAPA, The Use of Warm Mix Asphalt. EAPA - Position paper, (2014) 23. http://www.masterbuilder.co.in/the-use-of-warm-mix-asphalt/.

[158] K. Charlie, Reducing the environmental impact of road construction, (2012).

[159] J.A. Tichy, D.M. Meyer, Review of solid mechanics in tribology, Int. J. Solids Struct. 37 (2000) 391–400.

[160] S. Puchalski, Investigation of Warm Mix Asphalt Additives Using the Science of Tribology to Explain Improvements in Mixture Compaction, University of Wisconsin Madison, 2012.

[161] R.E. Rudge, E. Scholten, J.A. Dijksman, Advances and challenges in soft tribology with applications to foods, Curr. Opin. Food Sci. 27 (2019) 90–97. https://doi.org/10.1016/j.cofs.2019.06.011.

[162] Y. Bai, G. Fraisse, F. Wurtz, A. Foggia, Y. Deless, F. Domain, Experimental and numerical study of a directly PV-assisted domestic hot water system, Tribol. Int. 44 (2011) 1695–1703. https://doi.org/10.1016/j.triboint.2011.06.017.

[163] C.J. Barnes, T.H.C. Childs, B. Henson, C.H. Southee, Surface finish and touch - A case study in a new human factors tribology, Wear 257 (2004) 740–750. https://doi.org/10.1016/j.wear.2004.03.018.

[164] C. Popov, W. Kulisch, M. Jelinek, A. Bock, J. Strnad, Nanocrystalline diamond/amorphous carbon composite films for applications in tribology, optics and biomedicine, Thin Solid Films 494 (2006) 92–97. https://doi.org/10.1016/j.tsf.2005.07.163.

[165] Y. Meng, J. Xu, Z. Jin, B. Prakash, Y. Hu, A review of recent advances in tribology, Friction 8 (2020) 221–300. https://doi.org/10.1007/s40544-020-0367-2.

[166] M. Khadem, O. V. Penkov, H.K. Yang, D.E. Kim, Tribology of multilayer coatings for wear reduction: A review, Friction 5 (2017) 248–262. https://doi.org/10.1007/s40544-

017-0181-7.

[167] M.Z. Ibrahim, A.A.D. Sarhan, F. Yusuf, M. Hamdi, Biomedical materials and techniques to improve the tribological, mechanical and biomedical properties of orthopedic implants – A review article, J. Alloys Compd. 714 (2017) 636–667. https://doi.org/10.1016/j.jallcom.2017.04.231.

[168] I.J. Kim, Identifying shoe wear mechanisms and associated tribological characteristics: Importance for slip resistance evaluation, Wear 360–361 (2016) 77–86. https://doi.org/10.1016/j.wear.2016.04.020.

[169] A. Emami, S. Khaleghian, Investigation of tribological behavior of Styrene-Butadiene Rubber compound on asphalt-like surfaces, Tribol. Int. 136 (2019) 487–495. https://doi.org/10.1016/j.triboint.2019.04.002.

[170] L.I. Farfan-Cabrera, Tribology of electric vehicles: A review of critical components, current state and future improvement trends, Tribol. Int. 138 (2019) 473–486. https://doi.org/10.1016/j.triboint.2019.06.029.

[171] K. Holmberg, A. Erdemir, Influence of tribology on global energy consumption, costs and emissions, Friction 5 (2017) 263–284. https://doi.org/10.1007/s40544-017-0183-5.

[172] J.K. Katiyar, P. Ramkumar, T.V.V.L.N. Rao, J.P. Davim, Tribology in Materials and Applications, in: Mater. Forming, Mach. Tribol., Springer Nature Switzerland AG, 2020. https://doi.org/10.1007/978-3-030-47451-5.

[173] H. Czichos, D. Klaffke, E. Santner, M. Woydt, Advances in tribology: the materials point of view, Wear 190 (1995) 155–161. https://doi.org/10.1016/0043-1648(96)80014-7.

[174] H. Czichos, The principles of system analysis and their application to tribology, ASLE Trans. 17 (1974) 300–306. https://doi.org/10.1080/05698197408981470.

[175] R. Gallego, T. Cidade, R. Sánchez, C. Valencia, J.M. Franco, Tribology International

Tribological behaviour of novel chemically modi fi ed biopolymer-thickened lubricating greases investigated in a steel – steel rotating ball-on-three plates tribology cell, Tribiology Int. 94 (2016) 652–660. https://doi.org/10.1016/j.triboint.2015.10.028.

[176] S. Zhang, Recent developments of green tribology, Surf. Topogr. Metrol. Prop. 4(2) (2016) p.023004. https://doi.org/10.1088/2051-672X/4/2/023004.

[177] F. Sundus, M.A. Fazal, H.H. Masjuki, Tribology with biodiesel: A study on enhancing biodiesel stability and its fuel properties, Renew. Sustain. Energy Rev. 70 (2017) 399–412. https://doi.org/10.1016/j.rser.2016.11.217.

[178] T. Yan, L.P. Ingrassia, R. Kumar, M. Turos, F. Canestrari, X. Lu, M. Marasteanu, Evaluation of Graphite Nanoplatelets Influence on the Lubrication Properties of Asphalt Binders, Materials (Basel). 13 (2020) 772. https://doi.org/doi:10.3390/ma13030772.

[179] W. Zhai, N. Srikanth, L. Bing, K. Zhou, Carbon nanomaterials in tribology, Carbon N. Y. 119 (2017) 150–171. https://doi.org/10.1016/j.carbon.2017.04.027.

[180] K. Giannoukos, K. Salonitis, Study of the mechanism of friction on functionally active tribological Polyvinyl Chloride (PVC) – Aggregate composite surfaces, Tribol. Int. 141 (2020) 105906. https://doi.org/10.1016/j.triboint.2019.105906.

[181] S. Jaturunruangsri, Evaluation of Material Surface Profiling Methods : Contact versus Non-contact, Des. Phys. Sci. (2014) 1–99. http://bura.brunel.ac.uk/handle/2438/10431.

[182] P.L. Menezes, Kishore, S. V. Kailas, Studies on friction in an iron-steel tribo-system under dry and lubricated conditions, Mater. Manuf. Process. 23 (2008) 698–707. https://doi.org/10.1080/10426910802317086.

[183] H.J. Verbeek, Tribological systems and wear factors, Wear 56 (1979) 81–92. https://doi.org/10.1016/0043-1648(79)90008-5.

[184] P. Samyn, T.M. Tuzolana, Effect of test scale on the friction properties of pure and internal-lubricated cast polyamides at running-in, Polym. Test. 26 (2007) 660–675.

https://doi.org/10.1016/j.polymertesting.2007.04.002.

[185] Bharat Bhushan, Introduction to Tribology, John Wiley & Sons., 2013.

[186] B.K. Bairgi, U.A. Mannan, R.A. Tarefder, Influence of foaming on tribological and rheological characteristics of foamed asphalt, Constr. Build. Mater. 205 (2019) 186–195. https://doi.org/10.1016/j.conbuildmat.2019.02.009.

[187] U.A. Mannan, R.A. Tarefder, Tribological and rheological characterisation of asphalt binders at different temperatures, Road Mater. Pavement Des. 19 (2018) 445–452. https://doi.org/10.1080/14680629.2016.1251961.

[188] G.L. Baumgardner, G.R. Reinke, J.B. Ii, Lubricity Properties of Asphalt Binders Used in Hot-Mix and Warm-Mix Asphalt Pavements, in: 5th Eurasphalt Eurobitume Congr., 2012: pp. 13–15.

[189] H.P. Kavehpour, G.H. Mckinley, Tribo-rheometry : from gap-dependent rheology to tribology, Tribol. Lett. 17 (2004) 327–335.

[190] C. Clasen, P.G.H. Mckinley, Gap-Dependent Microrheometry of Complex Liquids, J. Nonnewton. Fluid Mech. 124.1–3 (2004) 1–10.

[191] A.J. Hanz, H.U. Bahia, Asphalt Binder Contribution to Mixture Workability and Application of Asphalt Lubricity Test to Estimate Compactability Temperatures for Warm-Mix Asphalt, Transp. Res. Rec. J. Transp. Res. Board 2371 (2013) 87–95. https://doi.org/10.3141/2371-10.

[192] B.K. Bairgi, U.A. Mannan, R.A. Tarefder, Tribological Approach to Demonstrate Workability of Foamed Warm-Mix Asphalt, 31 (2019). https://doi.org/10.1061/(ASCE)MT.1943-5533.0002843.

[193] B.K. Biswajit., Umme A. Mannan, Rafiqul A. Tarefder, Tribological Evaluation for an In-Depth Understanding of Improved Workability of Foamed Asphalt, Transp. Res. Rec. J. Transp. Res. Board 2673 (2019). https://doi.org/10.1177/0361198119835510.

[194] B.K. Bairgi, U.A. Manna, R.A. Tarefder, Tribological Evaluation of Asphalt Binder with Chemical Warm-Mix Additives, in: Airfield and Highway Pavements 2019, ASCE, 2019: pp. 266–273. https://doi.org/10.1061/9780784482469.027.

[195] L.P. Ingrassia, Xiaohu Lu, Mihai Marasteanu, Francesco Canestrari, Tribological Characterization of Graphene Nano-Platelet (GNP) Bituminous Binders, in: Int. Airf. Highw. Pavements Conf. 2019 Innov. Sustain. Highw. Airf. PavementTechnology.96-105, American Society of Civil Engineers (ASCE), 2019.

[196] Y.Q. Tan, L. Zhang, W.Q. Gong, M. Guo, Investigation of the effects of wax additive on the properties of asphalt binder, Constr. Build. Mater. 36 (2012) 578–584. https://doi.org/10.1016/j.conbuildmat.2012.06.024.

[197] R. Pereira, A. Almeida-Costa, C. Duarte, A. Benta, Warm mix asphalt: Chemical additives' effects on bitumen properties and limestone aggregates mixture compactibility, Int. J. Pavement Res. Technol. 11 (2018) 285–299. https://doi.org/10.1016/j.ijprt.2017.10.005.

[198] Y. Wen, Y. Wang, K. Zhao, D. Chong, W. Huang, G. Hao, S. Mo, The engineering, economic, and environmental performance of terminal blend rubberized asphalt binders with wax-based warm mix additives, J. Clean. Prod. 184 (2018) 985–1001. https://doi.org/10.1016/j.jclepro.2018.03.011.

[199] B.V. kok, M. Yilmaz, M. Akpolat, Effect of CR and FT-paraffin versus SBS modification in terms of conventional and rheological properties, Int. J. Pavement Eng. 18 (2017) 1052–1059. https://doi.org/10.1080/10298436.2016.1149832.

[200] M.R. Pouranian, M.A. Notani, M.T. Tabesh, B. Nazeri, M. Shishehbor, Rheological and environmental characteristics of crumb rubber asphalt binders containing non-foaming warm mix asphalt additives, Constr. Build. Mater. 238 (2020) 117707. https://doi.org/10.1016/j.conbuildmat.2019.117707.

[201] A. V. Kataware, D. Singh, Evaluating effectiveness of WMA additives for SBS modified binder based on viscosity, Superpave PG, rutting and fatigue performance, Constr. Build. Mater. 146 (2017) 436–444. https://doi.org/10.1016/j.conbuildmat.2017.04.043.

[202] F. Merusi, G. Polacco, S. Filippi, F. Giuliani, Structural transitions and physical networks in wax-modified bitumens, Road Mater. Pavement Des. 14 (2013) 289–309. https://doi.org/10.1080/14680629.2013.792292.

[203] N.A. Awazhar, F.H. Khairuddin, S. Rahmad, S.M. Fadzil, H.A. Omar, N.I. Nur, K.H. Badri, Engineering and leaching properties of asphalt binders modified with polyurethane and Cecabase additives for warm-mix asphalt application, Constr. Build. Mater. 238 (2020) 117699. https://doi.org/10.1016/j.conbuildmat.2019.117699.

[204] M. Fakhri, S.M. Sadati lamardi, H. Firouzifar, A.R. Ghanizadeh, Evaluation the effect of different Warm Asphalt additives on Bitumen and Asphalt Mix Properties, in: 2nd Int. Symp. Asph. Pavements Environ., 2012.

[205] A. Vaitkus, D. Čygas, A. Laurinavičius, V. Vorobjovas, Z. Perveneckas, Influence of warm mix asphalt technology on asphalt physical and mechanical properties, Constr. Build. Mater. 112 (2016) 800–806. https://doi.org/10.1016/j.conbuildmat.2016.02.212.

[206] E. Turbay, G. Martinez-Arguelles, T. Navarro-Donado, E. Sánchez-Cotte, R. Polo-Mendoza, E. Covilla-Valera, Rheological Behaviour of WMA-Modified Asphalt Binders with Crumb Rubber, Polymers (Basel). 14 (2022). https://doi.org/10.3390/polym14194148.

[207] N.M. Asmael, M.Y. Fattah, A.J. Kadhim, Exploring the effect of warm additives on fatigue cracking of asphalt mixtures, J. Appl. Sci. Eng. 23 (2020) 197–205. https://doi.org/10.6180/jase.202006_23(2).0003.

[208] Z. Hossain, A.M. Asce, S. Lewis, M. Zaman, F. Asce, A. Buddhala, E.O. Rear, Evaluation for Warm-Mix Additive-Modified Asphalt Binders Using Spectroscopy

Techniques, 25 (2013) 149–159. https://doi.org/10.1061/(ASCE)MT.1943-5533.0000562.

[209] S. Liu, A. Peng, S. Zhou, H. Meng, Effect of Foaming Water on Rheological and Microscopic Properties of Foamed Warm-Mix Asphalt Binders, J. Transp. Eng. Part B Pavements 145 (2019) 1–8. https://doi.org/10.1061/JPEODX.0000118.

[210] S. Lee, S.N. Amirkhanian, N. Park, K.W. Kim, Characterization of warm mix asphalt binders containing artificially long-term aged binders, Constr. Build. Mater. 23 (2009) 2371–2379. https://doi.org/10.1016/j.conbuildmat.2008.11.005.

[211] K. Zhang, Y. Luo, F. Chen, F. Han, Performance evaluation of new warm mix asphalt and water stability of its mixture based on laboratory tests, Constr. Build. Mater. 241 (2020) 118017. https://doi.org/10.1016/j.conbuildmat.2020.118017.

[212] A. Behl, S. Chandra, V.K. Aggarwal, S. Gangopadhyay, Zero Shear Viscosity of Bitumen-Filler Mastics of Warm-Mix Binders, J. Mater. Civ. Eng. 27 (2015). https://doi.org/10.1061/(asce)mt.1943-5533.0001232.

[213] H. Goli, S. Hesami, M. Ameri, Laboratory Evaluation of Damage Behavior of Warm Mix Asphalt Containing Steel Slag Aggregates, J. Mater. Civ. Eng. 29 (2017) 2–10. https://doi.org/10.1061/(asce)mt.1943-5533.0001832.

[214] F. Frigio, S. Raschia, D. Steiner, B. Hofko, F. Canestrari, Aging effects on recycled WMA porous asphalt mixtures, Constr. Build. Mater. 123 (2016) 712–718. https://doi.org/10.1016/j.conbuildmat.2016.07.063.

[215] B. Singh, N. Saboo, P. Kumar, Effect of Short-Term Aging on Creep and Recovery Response of Asphalt Binders, 143 (2017). https://doi.org/10.1061/JPEODX.0000018.

[216] D. Ragni, G. Ferrotti, X. Lu, F. Canestrari, Influence of chemical additives for warm mix asphalts on the short-term ageing of a plain bitumen, Road Mater. Pavement Des. 20 (2019) S34–S48. https://doi.org/10.1080/14680629.2019.1588772.

[217] F. Xiao, S.N. Amirkhanian, R. Zhang, Influence of Short-Term Aging on Rheological Characteristics of Non-Foaming WMA Binders, J. Perform. Constr. Facil. 26 (2012) 145–152. https://doi.org/10.1061/(asce)cf.1943-5509.0000223.

[218] A.R. Abbas, M. Nazzal, S. Kaya, S. Akinbowale, B. Subedi, L.A. Qtaish, Effect of warm mix asphalt on aging of asphalt binders, Proc. TMS Middle East - Mediterr. Mater. Congr. Energy Infrastruct. Syst. MEMA 2015 (2015) 55–64. https://doi.org/10.1002/9781119090427.ch6.

[219] H.H. Kim, M. Mazumder, S.-J. Lee, Micromorphology and Rheology of Warm Binders Depending on Aging, J. Mater. Civ. Eng. 29 (2017) 1–9. https://doi.org/10.1061/(asce)mt.1943-5533.0002082.

[220] B. Singh, N. Saboo, P. Kumar, Effect of Short-Term Aging on Creep and Recovery Response of Asphalt Binders, 143 (2017). https://doi.org/10.1061/JPEODX.0000018.

[221] B. Kheradmand, R. Muniandy, L.T. Hua, A. Solouki, A laboratory investigation on the rheological properties of aged and unaged organic wax modified asphalt binders, Pet. Sci. Technol. 33 (2015) 757–764. https://doi.org/10.1080/10916466.2015.1007383.

[222] M.E. Abdullah, M.R. Hainin, N.I.M. Yusoff, K.A. Zamhari, N. Hassan, Laboratory evaluation on the characteristics and pollutant emissions of nanoclay and chemical warm mix asphalt modified binders, Constr. Build. Mater. 113 (2016) 488–497. https://doi.org/10.1016/j.conbuildmat.2016.03.068.

[223] A.R. Abbas, M. Nazzal, S. Kaya, S. Akinbowale, B. Subedi, M.S. Arefin, L. Abu Qtaish, Effect of Aging on Foamed Warm Mix Asphalt Produced by Water Injection, J. Mater. Civ. Eng. 28 (2016) 04016128. https://doi.org/10.1061/(asce)mt.1943-5533.0001617.

[224] M. Sadeq, E. Masad, H. Al-Khalid, O. Sirin, D. Little, Rheological evaluation of shortand long-term performance for warm mix asphalt (WMA) binders, RILEM Bookseries 11 (2016) 129–139. https://doi.org/10.1007/978-94-017-7342-3_11.

[225] D. Ragni, G. Ferrotti, X. Lu, F. Canestrari, Effect of temperature and chemical additives on the short-term ageing of polymer modified bitumen for WMA, Mater. Des. 160 (2018) 514–526. https://doi.org/10.1016/j.matdes.2018.09.042.

[226] M. Iwański, M. Cholewińska, G. Mazurek, Viscoelastic Properties of Polymer Modified Bitumen in Warm Mix Asphalt Technology in Terms of Ageing, Procedia Eng. 172 (2017) 401–408. https://doi.org/10.1016/j.proeng.2017.02.007.

[227] Z. Arega, A. Bhasin, A. Motamed, F. Turner, Influence of Warm-Mix Additives and Reduced Aging on the Rheology of Asphalt Binders with Different Natural Wax Contents, J. Mater. Civ. Eng. 23 (2011) 1453–1459. https://doi.org/10.1061/(asce)mt.1943-5533.0000315.

[228] A. Raghavendra, M.S. Medeiros, M.M. Hassan, L.N. Mohammad, W. “Bill” King, Laboratory and Construction Evaluation of Warm-Mix Asphalt, J. Mater. Civ. Eng. 28 (2016) 04016023. https://doi.org/10.1061/(asce)mt.1943-5533.0001506.

[229] Z. Leng, A. Gamez, I.L. Al-Qadi, Mechanical Property Characterization of Warm-Mix Asphalt Prepared with Chemical Additives, J. Mater. Civ. Eng. 26 (2014) 304–311. https://doi.org/10.1061/(asce)mt.1943-5533.0000810.

[230] S. Rani, R. Ghabchi, S.A. Ali, M. Zaman, Laboratory characterization of asphalt binders containing a chemical-based warm mix asphalt additive, J. Test. Eval. 48 (2020). https://doi.org/10.1520/JTE20180409.

[231] D. Singh, P.K. Ashish, A. Kataware, A. Habal, Evaluating Performance of PPA-and-Elvaloy-Modified Binder Containing WMA Additives and Lime Using MSCR and LAS Tests, J. Mater. Civ. Eng. 29 (2017) 1–11. https://doi.org/10.1061/(asce)mt.1943-5533.0001934.

[232] A. Behl, G. Bharath, S. Chandra, Characterization of Fatigue Resistance of Warm Mix Binders Using Linear Amplitude Sweep Test, Int. J. Pavement Res. Technol. 15 (2022)

433–441. https://doi.org/10.1007/s42947-021-00031-3.

[233] H. Wang, X. Liu, H. Zhang, P. Apostolidis, T. Scarpas, T. Scarpas, Asphalt-rubber interaction and performance evaluation of rubberised asphalt binders containing non-foaming warm-mix additives asphalt binders containing non-foaming warm-mix additives, (2020). https://doi.org/10.1080/14680629.2018.1561380.

[234] A. Kumar, R. Choudhary, P.S. Kandhal, A. Julaganti, O.P. Behera, A. Singh, R. Kumar, Fatigue characterisation of modified asphalt binders containing warm mix asphalt additives, Road Mater. Pavement Des. 21 (2020) 519–541. https://doi.org/10.1080/14680629.2018.1507921.

[235] M.E. Abdullah, K.A. Zamhari, M.R. Hainin, E.A. Oluwasola, N.A. Hassan, N.I.M. Yusoff, Engineering properties of asphalt binders containing nanoclay and chemical warm-mix asphalt additives, Constr. Build. Mater. 112 (2016) 232–240. https://doi.org/10.1016/j.conbuildmat.2016.02.089.

[236] M. Zaumanis, E. Olesen, V. Haritonovs, G. Brencis, J. Smirnovs, Laboratory evaluation of organic and chemical warm mix asphalt technologies for SMA asphalt, Balt. J. Road Bridg. Eng. 7 (2012) 191–197. https://doi.org/10.3846/bjrbe.2012.26.

[237] Y.R. Kim, J. Zhang, H. Ban, Moisture damage characterization of warm-mix asphalt mixtures based on laboratory-field evaluation, Constr. Build. Mater. 31 (2012) 204–211. https://doi.org/10.1016/j.conbuildmat.2011.12.085.

[238] H. Malladi, D. Ayyala, A.A. Tayebali, N.P. Khosla, Laboratory Evaluation of Warm-Mix Asphalt Mixtures for Moisture and Rutting Susceptibility, J. Mater. Civ. Eng. 27 (2015) 04014162. https://doi.org/10.1061/(asce)mt.1943-5533.0001121.

[239] V. Mishra, D. Singh, Evaluating Factors Affecting Aggregate-Bitumen Interfacial Strength Using Binder Bond-Strength Test, J. Mater. Civ. Eng. 33 (2021) 04021089. https://doi.org/10.1061/(asce)mt.1943-5533.0003703.

[240] M. Sukhija, N. Saboo, A. Pani, Effect of warm mix asphalt (WMA) technologies on the moisture resistance of asphalt mixtures, Constr. Build. Mater. 369 (2023) 130589. https://doi.org/10.1016/j.conbuildmat.2023.130589.

[241] U. Bagampadde, U. Isacsson, B.M. Kiggundu, Influence of aggregate chemical and mineralogical composition on stripping in bituminous mixtures, Http://Dx.Doi.Org/10.1080/10298430500440796 6 (2007) 229–239. https://doi.org/10.1080/10298430500440796.

[242] J. Zhang, A.K. Apeagyei, G.D. Airey, J.R.A. Grenfell, Influence of aggregate mineralogical composition on water resistance of aggregate-bitumen adhesion, Int. J. Adhes. Adhes. 62 (2015) 45–54. https://doi.org/10.1016/j.ijadhadh.2015.06.012.

[243] A. Habal, D. Singh, Effects of warm mix asphalt additives on bonding potential and failure pattern of asphalt-aggregate systems using strength and energy parameters, Int. J. Pavement Eng. 22 (2021) 467–479. https://doi.org/10.1080/10298436.2019.1623399.

[244] F.A.K. Salman Maqbool , Ammad Hassan Khan , Mujasim Ali Rizvi , Aasim Inam, Modelling and evaluating moisture susceptibility of laboratory prepared asphalt concrete mixtures, Ain Shams Eng. J. 13 (2022).

[245] X. Gan, W. Zhang, J. Li, H. Tang, P. Zhong, Influence of Aggregate and Asphalt Type on the Bond Strength between Asphalt and Aggregates and Its Self-Healing Properties, Adv. Mater. Sci. Eng. 2022 (2022). https://doi.org/10.1155/2022/1353102.

[246] R. Moraes, R. Velasquez, H. Bahia, Measuring the Effect of moisture on asphalt-aggregate bond with the bitumen bond strength test, Transp. Res. Rec. (2011) 70–81. https://doi.org/10.3141/2209-09.

[247] M.Z. Alavi, E.Y. Hajj, A. Hanz, H.U. Bahia, Evaluating adhesion properties and moisture damage susceptibility of warm-mix asphalts: Bitumen bond strength and dynamic modulus ratio tests, Transp. Res. Rec. 2295 (2012) 44–53.

https://doi.org/10.3141/2295-06.

[248] W.S. Mogawer, A.J. Austerman, H.U. Bahia, Evaluating the Effect of Warm-Mix Asphalt Technologies on Moisture Characteristics of Asphalt Binders and Mixtures, Transp. Res. Rec. 2209 (2011) 52–60. https://doi.org/10.3141/2209-07.

[249] J. Zhang, G.D. Airey, J. Grenfell, Z. Yao, Laboratory evaluation of Rediset modified bitumen based on rheology and adhesion properties, 152 (2017) 683–692.

[250] S. Liu, S. Zhou, A. Peng, Analysis of moisture susceptibility of foamed warm mix asphalt based on cohesion, adhesion, bond strength, and morphology, J. Clean. Prod. 277 (2020) 123334. https://doi.org/10.1016/j.jclepro.2020.123334.

[251] A. Habal, D. Singh, Establishing threshold value of surface free energy and binder bond strength parameters for basaltic asphalt mixes, Road Mater. Pavement Des. (2021). https://doi.org/10.1080/14680629.2021.1925576.

[252] T.A. Ahmed, E.Y. Hajj, D.S. Bahzad, M. Piratheepan, A. Warrag, Investigation of the Rheological and Bonding Characteristics of Crumb Rubber-Modified Asphalt Binders Mixed with Warm Mix Asphalt Additive and Antistrip Agent, Int. J. Pavement Res. Technol. 15 (2022) 509–524. https://doi.org/10.1007/s42947-021-00033-1.

[253] B. Li, A. Li, X. Chen, X. Nan, Z. Li, K.Q. A, H. Ji, Multi-scale investigation on the adhesion properties of warm-mixed recycled SBS modified asphalt, Constr. Build. Mater. 377 (2023).

[254] F. Xiao, W. Zhao, T. Gandhi, S.N. Amirkhanian, Influence of Antistripping Additives on Moisture Susceptibility of Warm Mix Asphalt Mixtures, J. Mater. Civ. Eng. 22 (2010) 1047–1055. https://doi.org/10.1061/(asce)mt.1943-5533.0000111.

[255] H. Ziari, A. Amini, A. Goli, The effect of different aging conditions and strain levels on relationship between fatigue life of asphalt binders and mixtures, Constr. Build. Mater. 244 (2020) 118345. https://doi.org/10.1016/j.conbuildmat.2020.118345.

[256] B. Singh, N. Saboo, P. Kumar, Use of Fourier transform infrared spectroscopy to study ageing characteristics of asphalt binders, Pet. Sci. Technol. 35 (2017) 1648–1654. https://doi.org/10.1080/10916466.2017.1350710.

[257] B. Singh, P. Kumar, Effect of polymer modification on the ageing properties of asphalt binders : Chemical and morphological investigation, Constr. Build. Mater. 205 (2019) 633–641. https://doi.org/10.1016/j.conbuildmat.2019.02.050.

[258] X. Lu, U. Isacsson, Effect of ageing on bitumen chemistry and rheology, Constr. Build. Mater. 16 (2002) 15–22. https://doi.org/10.1016/S0950-0618(01)00033-2.

[259] O. Sirin, D.K. Paul, E. Kassem, State of the Art Study on Aging of Asphalt Mixtures and Use of Antioxidant Additives, Adv. Civ. Eng. 2018 (2018). https://doi.org/10.1155/2018/3428961.

[260] A. Behl, S. Chandra, Aging characteristics of warm-mix asphalt binders, J. Mater. Civ. Eng. 29 (2017) 1–7. https://doi.org/10.1061/(ASCE)MT.1943-5533.0002013.

[261] C. Raab, I. Camargo, M.N. Partl, Ageing and performance of warm mix asphalt pavements, J. Traffic Transp. Eng. (English Ed. 4 (2017) 388–394. https://doi.org/10.1016/j.jtte.2017.07.002.

[262] A. Abed, N. Thom, D. Lo Presti, G. Airey, Thermo-rheological analysis of WMA-additive modified binders, Mater. Struct. Constr. 53 (2020) 1–13. https://doi.org/10.1617/s11527-020-01480-1.

[263] R. Tauste, Understanding the bitumen ageing phenomenon : A review, Constr. Build. Mater. 192 (2018) 593–609. https://doi.org/10.1016/j.conbuildmat.2018.10.169.

[264] P.A. Dokandari, A. Topal, Effects of warm mix asphalt additives on aging characteristics of bituminous mixtures, Period. Polytech. Civ. Eng. 59 (2015) 475–486. https://doi.org/10.3311/PPci.7364.

[265] G. Ferrotti, H. Baaj, J. Besamusca, M. Bocci, A. Cannone-Falchetto, J. Grenfell, B.

Hofko, L. Porot, L. Poulikakos, Z. You, Comparison between bitumen aged in laboratory and recovered from HMA and WMA lab mixtures, Mater. Struct. Constr. 51 (2018) 1–13. https://doi.org/10.1617/s11527-018-1270-4.

[266] X. Yu, Z. Leng, T. Wei, Investigation of the Rheological Modification Mechanism of Warm-Mix Additives on Crumb-Rubber-Modified Asphalt, J. Mater. Civ. Eng. 26 (2014) 312–319. https://doi.org/10.1061/(asce)mt.1943-5533.0000808.

[267] I. Mohammadi, H. Khabbaz, Challenges associated with optimisation of blending, mixing and compaction temperatures for asphalt mixture modified with crumb rubber modifier (CRM), Appl. Mech. Mater. 256–259 (2013) 1837–1844. https://doi.org/10.4028/www.scientific.net/AMM.256-259.1837.

[268] S.J. Lee, S.N. Amirkhanian, S.Z. Kwon, The effects of compaction temperature on CRM mixtures made with the SGC and the Marshall compactor, Constr. Build. Mater. 22 (2008) 1122–1128. https://doi.org/10.1016/j.conbuildmat.2007.03.003.

[269] M. Pérez-Martínez, F. Moreno-Navarro, J. Martín-Marín, C. Ríos-Losada, M.C. Rubio-Gámez, Analysis of cleaner technologies based on waxes and surfactant additives in road construction, J. Clean. Prod. 65 (2014) 374–379. https://doi.org/10.1016/j.jclepro.2013.09.012.

[270] A. V. Kataware, D. Singh, Dynamic mechanical analysis of crumb rubber modified asphalt binder containing warm mix additives, Int. J. Pavement Eng. 20 (2019) 1044–1054. https://doi.org/10.1080/10298436.2017.1380806.

[271] A. Ghavibazoo, M. Abdelrahman, M. Ragab, Effect of crumb rubber modifier dissolution on storage stability of crumb rubber-modified Asphalt, Transp. Res. Rec. (2013) 109–115. https://doi.org/10.3141/2370-14.

[272] M. Jamal, F. Giustozzi, Low-content crumb rubber modified bitumen for improving Australian local roads condition, J. Clean. Prod. 271 (2020) 122484.

https://doi.org/10.1016/j.jclepro.2020.122484.

[273] M. Ameri, F. Yazdipanah, A. Rahimi Yengejeh, A. Afshin, Production temperatures and mechanical performance of rubberized asphalt mixtures modified with two warm mix asphalt (WMA) additives, Mater. Struct. Constr. 53 (2020) 1–16. https://doi.org/10.1617/s11527-020-01542-4.

[274] D. Singh, P.K. Ashish, A. Kataware, A. Habal, Evaluating performance of PPA-and-Elvaloy-modified binder containing WMA additives and lime using MSCR and LAS tests, J. Mater. Civ. Eng. 29 (2017) 1–11. https://doi.org/10.1061/(ASCE)MT.1943-5533.0001934.

[275] M. Fakhri, A.R. Ghanizadeh, H. Omrani, Comparison of Fatigue Resistance of HMA and WMA Mixtures Modified by SBS, Procedia - Soc. Behav. Sci. 104 (2013) 168–177. https://doi.org/10.1016/j.sbspro.2013.11.109.

[276] A.W. Ali, H.H. Kim, M. Mazumder, M.S. Lee, S.J. Lee, Multiple Stress Creep Recovery (MSCR) characterization of polymer modified asphalt binder containing wax additives, Int. J. Pavement Res. Technol. (2018) 1–15. https://doi.org/10.1016/j.ijprt.2018.05.001.

[277] M. Reza Pouranian and Mehdi Shishehbor, Sustainability Assessment of Green Asphalt Mixtures: A Review, Sustain. 13 (2021). https://doi.org/10.3390/su132413828.

[278] H. Kim, S.J. Lee, S.N. Amirkhanian, Influence of warm mix additives on PMA mixture properties, J. Transp. Eng. 138 (2012) 991–997. https://doi.org/10.1061/(ASCE)TE.1943-5436.0000406.

[279] H. Kim, S.J. Lee, S.N. Amirkhanian, Rheology of warm mix asphalt binders with aged binders, Constr. Build. Mater. 25 (2011) 183–189. https://doi.org/10.1016/j.conbuildmat.2010.06.040.

[280] H. Kim, S.J. Lee, S.N. Amirkhanian, Effects of warm mix asphalt additives on performance properties of polymer modified asphalt binders, Can. J. Civ. Eng. 37 (2010)

17–24. https://doi.org/10.1139/L09-118.

[281] Y. Edwards, Y. Tasdemir, A.A. Butt, Energy saving and environmental friendly wax concept for polymer modified mastic asphalt, Mater. Struct. Constr. 43 (2010) 123–131. https://doi.org/10.1617/s11527-010-9603-y.

[282] D. Ge, K. Yan, L. You, Z. Wang, Modification mechanism of asphalt modified with Sasobit and Polyphosphoric acid (PPA), Constr. Build. Mater. 143 (2017) 419–428. https://doi.org/10.1016/j.conbuildmat.2017.03.043.

[283] J. Oner, B. Sengoz, S.F. Rija, A. Topal, Investigation of the rheological properties of elastomeric polymer-modified bitumen using warm-mix asphalt additives, Road Mater. Pavement Des. 18 (2017) 1049–1066. https://doi.org/10.1080/14680629.2016.1206484.

[284] J. Baek, S.Y. Lee, H.J. Lee, Comparative Evaluation of WMA Additives Effects on Conventional and Polymer Modified Asphalt Pavements, KSCE J. Civ. Eng. 22 (2018) 2099–2108. https://doi.org/10.1007/s12205-018-1785-9.

[285] H. Kim, Performance Evaluation of SBS Modified Asphalt Mixtures using Warm mix technologies, PhD Thesis, Clemson Univ. (2010) 177.

[286] M.M.E. Zumrawi, S.A. Sheikh Edrees, Comparison of Marshall and Superpave Asphalt Design Methods for Sudan Pavement Mixes, Int. J. Sci. Tech. Adv. 2 (2016) 29–35.

[287] M. Sadeq, H. Al-Khalid, E. Masad, O. Sirin, Comparative evaluation of fatigue resistance of warm fine aggregate asphalt mixtures, Constr. Build. Mater. 109 (2016) 8–16. https://doi.org/10.1016/j.conbuildmat.2016.01.045.

[288] Z. Chamoun, M.I. Souliman, E.Y. Hajj, P. Sebaaly, Evaluation of select warm mix additives with polymer and rubber modified asphalt mixtures, Can. J. Civ. Eng. 42 (2015) 377–388. https://doi.org/10.1139/cjce-2013-0512.

[289] P. V. Shivaprasad, F. Xiao, S.N. Amirkhanian, Evaluation of moisture sensitivity of stone matrix asphalt mixtures using polymerised warm mix asphalt technologies, Int. J.

Pavement Eng. 13 (2012) 152–165. https://doi.org/10.1080/10298436.2011.643792.

[290] S. Hesami, H. Roshani, G.H. Hamedi, A. Azarhoosh, Evaluate the mechanism of the effect of hydrated lime on moisture damage of warm mix asphalt, Constr. Build. Mater. 47 (2013) 935–941. https://doi.org/10.1016/j.conbuildmat.2013.05.079.

[291] G.C.H.B.D. Prowell, EVALUATION OF EVOTHERM® FOR USE IN WARM MIX ASPHALT, NCAT Rep. 06-02 Eval. (2006). https://lightspeed.eng.auburn.edu/research/centers/ncat/files/reports/2006/rep06-02.pdf.

[292] R. Zettler, Warm mix stands up to its trials, Better Roads 76 (2006) 16–21.

[293] D.C. Brown, Warm Mix Picks Up Steam, Better Roads Mag. (2007) 10–11.

[294] E. Morisson, Flexible Pavements, Flex. Pavements Ohio | (n.d.) 1–5.

[295] H. Wagner, Warm Mix for Yellowstone, Assoc. Constr. Publ. (2007) 913–916. https://doi.org/10.4135/9781544377230.n128.

[296] Brad Neitzke and Bruce Wasill, Placement of warm mix asphalt on the east entrance road of Yellowstone National Park, Fhwa-Wfl/Td 09-002 (2009) 1 online resource (16 p.). http://purl.access.gpo.gov/GPO/LPS119091.

[297] A.A. Cascione, R.C. Williams, J. Yu, Performance testing of asphalt pavements with recycled asphalt shingles from multiple field trials, Constr. Build. Mater. 101 (2015) 628–642. https://doi.org/10.1016/j.conbuildmat.2015.09.027.

[298] and R.C.W. Ashley Buss, Mohamed Rashwan, Investigation of warm-mix asphalt using Iowa aggregates., 2010.

[299] J.W. Cindy K. Estakhri, Rongji Cao, Allex E Alvarez, Allex E Alvarez, Production, Placement, and Performance Evaluation of Warm Mix Asphalt in Texas, in: Geotech. Spec. Publ., 2009. https://doi.org/10.1061/41045.

[300] K.R. Hansen, A. Copeland, Annual Asphalt Pavement Industry Survey on Recycled

Materials and Warm-Mix Asphalt Usage, 2014. https://www.asphaltpavement.org/PDFs/IS138/IS138-2013_RAP-RAS-WMA_Survey_Final.pdf.

[301] J.K. Davidson, Warm Asphalt Mix Technology – The Canadian Perspective, AAPA Pavements, Sydney, New South Wales (2007).

[302] O.R. Larsen, Ø. Moen, C. Robertus, B.G. Koenders, WAM Foam Asphalt Production at Lower Operating Temperatures as an Environmental Friendly Alternative to HMA, 3rd Eurasphalt Eurobitume Congr. Vienna 137 (2004) 641–650.

[303] P. Wu, T. Li, J. Guo, The Investigation and Evaluation of Service Performance of Warm Mix Asphalt Modifier, (2015) 1420–1423. https://doi.org/10.2991/icadme-15.2015.262.

[304] R. Motta, L. Bernucci, D. Souza, Y. Brosseaud, J. Fernando, L. Field, Field performance and laboratory evaluation of warm mix asphalt produced with rubberized bitumen, 5th Eurasphalt Eurobitume Congr. (2012). https://hal.archives-ouvertes.fr/hal-00851053.

[305] T.L. K. Naidoo, Innovative warm mix asphalt trials completed near Durban, 2008.

[306] SABITA, Best practice guideline for warm mix asphalt - Manual 32, 2011.

[307] Y.S. Kumbargeri, K.P. Biligiri, Understanding Aging Behaviour of Conventional Asphalt Binders Used in India, Transp. Res. Procedia 17 (2016) 282–290. https://doi.org/10.1016/j.trpro.2016.11.094.

[308] IS: 73, Paving bitumen – specification. New Delhi, India, Bur. Indian Stand. (2013) 1–4.

[309] Indian Standard, IS 15462: Polymer and Rubber Modified Bitumen - Specifications, (2019).

[310] B. of I. Standards, IS 1203: 1978: Methods for Testing Tar and Bituminous Materials, Penetration test, New Delhi, 1978.

[311] B. of I. Standards, IS 1205: 1978: Methods for Testing Tar and Bituminous Materials,

Softening Point Test, New Delhi, 1978.

[312] B. of I. Standards, IS 1206: 1978: Methods for Testing Tar and Bituminous Materials, Viscosity Test, New Delhi, 1978.

[313] IS 1202 Determination of Specific Gravity, Bur. Indian Stand. New Delhi (1978).

[314] ASTM D7175, Standard Test Method for Determining the Rheological Properties of Asphalt Binder Using a Dynamic Shear Rheometer, West Conshohocken, PA (2015).

[315] K. Liu, K. Zhang, J. Wu, B. Muhunthan, X. Shi, Evaluation of mechanical performance and modification mechanism of asphalt modified with graphene oxide and warm mix additives, J. Clean. Prod. 193 (2018) 87–96. https://doi.org/10.1016/j.jclepro.2018.05.040.

[316] Y. Edwards, Influence of waxes on bitumen and asphalt concrete mixture performance, Road Mater. Pavement Des. 10 (2009) 313–335. https://doi.org/10.1080/14680629.2009.9690197.

[317] P. Garidel, A. Blume, W. Hübner, A Fourier transform infrared spectroscopic study of the interaction of alkaline earth cations with the negatively charged phospholipid 1,2-dimyristoyl-sn-glycero-3-phosphoglycerol, Biochim. Biophys. Acta - Biomembr. 1466 (2000) 245–259. https://doi.org/10.1016/S0005-2736(00)00166-8.

[318] P. Garidel, W. Richter, G. Rapp, A. Blume, Structural and morphological investigations of the formation of quasi-crystalline phases of 1,2-dimyristoyl-sn-glycero-3-phosphoglycerol (DMPG), Phys. Chem. Chem. Phys. 3 (2001) 1504–1513. https://doi.org/10.1039/b009881g.

[319] S.K. Singh, A. Pandey, S.S. Ravindranath, Effect of additives on the thermal stability of SBS modified binders during storage at elevated temperatures, Constr. Build. Mater. 314 (2022) 125609. https://doi.org/10.1016/j.conbuildmat.2021.125609.

[320] A. Carmona-Hernandez, E. Vazquez-Velez, J. Uruchurtu-Chavarin, J.G. Gonzalez-

Rodriguez, L. Martinez-Gomez, Use of an imidazol synthetized from palm oil as a corrosion inhibitor for a supermartensitic stainless steel in H2S, Green Chem. Lett. Rev. 12 (2019) 89–99. https://doi.org/10.1080/17518253.2019.1578997.

[321] E. Vessally, E. Fereyduni, H. Shabrendi, M.D. Esrafili, One-pot synthesis, FT-IR and density functional method (DFT) studies on N-benzyl-N-ethyl-N-[5-nitro-2-(1,1,3,3-Tetramethylbutylamino)-1-benzofuran-3-yl] amine, Spectrochim. Acta - Part A Mol. Biomol. Spectrosc. 116 (2013) 65–73. https://doi.org/10.1016/j.saa.2013.06.103.

[322] S. Parambadath, A. Mathew, S.Y. Kim, S.S. Park, Fe 3 + -bis-ethylenediamine complex bridged periodic mesoporous organosilica for the efficient removal of arsenate and chromate, 90 (2018) 869–884.

[323] U. by B.A. Philip J. Launer, INFRARED ANALYSIS OF ORGANOSILICON COMPOUNDS: SPECTRA-STRUCTURE CORRELATIONS, Silicon Compd. Silanes Silicones 12 (2013) 195–197. https://doi.org/10.1080/01919519008552219.

[324] P. Deshmukh, D. Peshwe, S. Pathak, FTIR and TGA analysis in relation with the % crystallinity of the SiO2 obtained by burning rice husk at various temperatures, Adv. Mater. Res. 585 (2012) 77–81. https://doi.org/10.4028/www.scientific.net/AMR.585.77.

[325] N. Shukla, C. Liu, P.M. Jones, D. Weller, FTIR study of surfactant bonding to FePt nanoparticles, J. Magn. Magn. Mater. 266 (2003) 178–184. https://doi.org/10.1016/S0304-8853(03)00469-4.

[326] Y. Zou, S. Amirkhanian, S. Xu, Y. Li, Y. Wang, J. Zhang, Effect of different aqueous solutions on physicochemical properties of asphalt binder, Constr. Build. Mater. 286 (2021) 122810. https://doi.org/10.1016/j.conbuildmat.2021.122810.

[327] J. Zhang, A.K. Apeagyei, G.D. Airey, J.R.A. Grenfell, Influence of aggregate mineralogical composition on water resistance of aggregate-bitumen adhesion, Int. J.

Adhes. Adhes. 62 (2015) 45–54. https://doi.org/10.1016/j.ijadhadh.2015.06.012.

[328] IS 2386 (Part 4), Methods of test for aggregates for concrete:Part IV- Mechanical Properties, Bur. Indian Stand. New Delhi (1963).

[329] IS 2386 (Part 1), Methods of test for aggregates for concrete:PART I-Particle size and shape, Bur. Indian Stand. New Delhi (1963).

[330] IS 2386 (Part 3), Methods of test for aggregates for concrete: PART III- Specific gravity, density, voids, absorption and bulking, Bur. Indian Stand. New Delhi (1963).

[331] IS 2386 (Part 5), Methods of test for aggregates for concrete: Part V-Soundness, Bur. Indian Stand. New Delhi (1963).

[332] J. Wu, L. Wang, L. Meng, Analysis of mineral composition and microstructure of gravel aggregate based on XRD and SEM, Road Mater. Pavement Des. 18 (2017) 139–148. https://doi.org/10.1080/14680629.2017.1329869.

[333] U. Bagampadde, U. Isacsson, B.M. Kiggundu, Influence of aggregate chemical and mineralogical composition on stripping in bituminous mixtures, Int. J. Pavement Eng. 6 (2005) 229–239. https://doi.org/10.1080/10298430500440796.

[334] S.A. Asif, N. Ahmad, Effect of Different Factors on Bonding Properties of Bitumen–Aggregate Combinations, J. Mater. Civ. Eng. 34 (2022) 1–13. https://doi.org/10.1061/(asce)mt.1943-5533.0004117.

[335] S.A. Asif, N. Ahmed, A. Hayat, S. Hussan, F. Shabbir, K. Mehmood, Study of adhesion characteristics of different bitumen–aggregate combinations using bitumen bond strength test, J. Chinese Inst. Eng. (2018) 1–11. https://doi.org/10.1080/02533839.2018.1490205.

[336] D. Singh, P.K. Ashish, S. Chander, A. Habal, A. Kataware, Effect of Warm-Mix Additives and Lime on Intermediate-Temperature Fracture Property of RET- and PPA-Modified Asphalt Binder, J. Mater. Civ. Eng. 31 (2019) 1–15.

https://doi.org/10.1061/(ASCE)MT.1943-5533.0002756.

[337] M.O. Hamzah, B. Golchin, C.T. Tye, Determination of the optimum binder content of warm mix asphalt incorporating Rediset using response surface method, Constr. Build. Mater. 47 (2013) 1328–1336. https://doi.org/10.1016/j.conbuildmat.2013.06.023.

[338] H.M.R.D. Silva, J.R.M. Oliveira, C.I.G. Ferreira, P.A.A. Pereira, Assessment of the performance of warm mix asphalts in road pavements, Int. J. Pavement Res. Technol. 3 (2010) 119–127. https://doi.org/10.6135/ijprt.org.tw/2010.3(3).119.

[339] M. Ameri, D. Mirzaiyan, A. Amini, Rutting Resistance and Fatigue Behavior of Gilsonite-Modified Asphalt Binders, J. Mater. Civ. Eng. 30 (2018) 1–9. https://doi.org/10.1061/(asce)mt.1943-5533.0002468.

[340] D. Singh, B. Showkat, S. Girimath, Experimental, analytical, and analogical study of the effect of RAP extracted binder on rheology of polymer modified binder, Road Mater. Pavement Des. 23 (2022) 1011–1036. https://doi.org/10.1080/14680629.2020.1868552.

[341] A. Ali, A. Abbas, M. Nazzal, A. Alhasan, A. Roy, D. Powers, Effect of temperature reduction, foaming water content, and aggregate moisture content on performance of foamed warm mix asphalt, Constr. Build. Mater. 48 (2013) 1058–1066. https://doi.org/10.1016/j.conbuildmat.2013.07.081.

[342] Hussain Bahia, Transportation research circular E-C105: Factors Affecting Compaction of Asphalt Pavements, Washington, DC 20001, 2006. https://doi.org/10.17226/23282.

[343] Y. Yildirim, M. Solaimanian, T.W. Kennedy, Mixing and Compaction Temperatures for Hot Mix Asphalt Concrete, Cent. Transp. Res. Univ. Texas Austin 1250–5 (2000) 100.

[344] MoRTH (Ministry of Road Transport and Highways), 2013. Specifications for Road and Bridge Works (Fifth Revision). Indian Road Congress, (n.d.).

[345] M.D. Elwardany, F. Yousefi Rad, C. Castorena, Y.R. Kim, Evaluation of asphalt mixture laboratory long-term ageing methods for performance testing and prediction,

Road Mater. Pavement Des. 18 (2017) 28–61. https://doi.org/10.1080/14680629.2016.1266740.

[346] P.K. Behera, A.K. Singh, M. Amaranatha Reddy, An alternative method for short- and long-term ageing for bitumen binders, Road Mater. Pavement Des. 14 (2013) 445–457. https://doi.org/10.1080/14680629.2013.799086.

[347] R. Tauste, F. Moreno-Navarro, M. Sol-Sánchez, M.C. Rubio-Gámez, Understanding the bitumen ageing phenomenon: A review, Constr. Build. Mater. 192 (2018) 593–609. https://doi.org/10.1016/j.conbuildmat.2018.10.169.

[348] S. Sreedhar, E. Coleri, The effect of long-term aging on fatigue cracking resistance of asphalt mixtures, Int. J. Pavement Eng. 23 (2022) 308–320. https://doi.org/10.1080/10298436.2020.1745206.

[349] H. Luo, H. Leng, H. Ding, J. Xu, H. Lin, C. Ai, Y. Qiu, Low-temperature cracking resistance, fatigue performance and emission reduction of a novel silica gel warm mix asphalt binder, Constr. Build. Mater. 231 (2020) 117118. https://doi.org/10.1016/j.conbuildmat.2019.117118.

[350] M.J. Farrar, R.W. Grimes, C. Sui, J.P. Planche, T.F.-H. Turner, Thin film oxidative aging and low temperature performance grading using small plate dynamic shear rheometry: an alternative to standard RTFO, PAV, and BBR., in: 5th Eurasphalt Eurobitume Congr., 2012.

[351] J. Youtcheff, Tech Brief: The Universal Simple Aging Test, (2016) 1–8.

[352] T.A. Kumar, I.J.S. Sandeep, M.R. Nivitha, V. Chowdary, J.M. Krishnan, Quantification of Aging Compounds in Evotherm-Modified Warm-Mix Asphalt Binder Using Fourier Transform Infrared Spectroscopy, Arab. J. Sci. Eng. 44 (2019) 8429–8437. https://doi.org/10.1007/s13369-019-03965-w.

[353] M.R. Nivitha, E. Prasad, J.M. Krishnan, Ageing in modified bitumen using FTIR

spectroscopy, Int. J. Pavement Eng. 17 (2016) 565–577. https://doi.org/10.1080/10298436.2015.1007230.

[354] B. Bora, A. Das, Estimation of binder quantity in a binary blend of asphalt binders using FTIR, Transp. Res. Procedia 48 (2020) 3756–3763. https://doi.org/10.1016/j.trpro.2020.08.044.

[355] R.S. Mullapudi, K. Sudhakar Reddy, An investigation on the relationship between FTIR indices and surface free energy of RAP binders, Road Mater. Pavement Des. 21 (2020) 1326–1340. https://doi.org/10.1080/14680629.2018.1552889.

[356] X. Hou, S. Lv, Z. Chen, F. Xiao, Applications of Fourier transform infrared spectroscopy technologies on asphalt materials, Meas. J. Int. Meas. Confed. 121 (2018) 304–316. https://doi.org/10.1016/j.measurement.2018.03.001.

[357] AASHTO T350, Standard Method of Test for Multiple Stress Creep Recovery (MSCR) Test of Asphalt Binder Using a Dynamic Shear Rheometer (DSR), 2019.

[358] AASHTO MP19, Standard Specification for Performance-Graded Asphalt Binder Using Multiple Stress Creep Recovery (MSCR) Test, AASHTO MP 19, Washington, DC (2013).

[359] AASHTO TP101, Standard Method of Test for Estimating Damage Tolerance of Asphalt Binders Using the Linear Amplitude Sweep, AASHTO MP 19, Washington, DC (2014).

[360] D. Singh, P.K. Ashish, A. Kataware, A. Habal, Evaluating Performance of PPA-and-Elvaloy-Modified Binder Containing WMA Additives and Lime Using MSCR and LAS Tests, J. Mater. Civ. Eng. 29 (2017) 04017064. https://doi.org/10.1061/(asce)mt.1943-5533.0001934.

[361] D. Singh, B. Showkat, B. Rajan, A. Shah, Rheological Interference of Amine and Silane–Based Antistripping Agents on Crumb Rubber–Modified Binder, J. Mater. Civ.

Eng. 32 (2020) 04019347. https://doi.org/10.1061/(asce)mt.1943-5533.0003004.

[362] N. Saboo, M. Sukhija, G. Singh, Effect of Nanoclay on Physical and Rheological Properties of Waste Cooking Oil–Modified Asphalt Binder, J. Mater. Civ. Eng. 33 (2021) 04020490. https://doi.org/10.1061/(asce)mt.1943-5533.0003598.

[363] H. Zhang, K. Shen, G. Xu, J. Tong, R. Wang, D. Cai, X. Chen, Fatigue resistance of aged asphalt binders: An investigation of different analytical methods in linear amplitude sweep test, Constr. Build. Mater. 241 (2020) 118099. https://doi.org/10.1016/j.conbuildmat.2020.118099.

[364] V. Mishra, D. Singh, Impact of short-term aging temperatures of asphalt binder and aggregate roughness levels on bond strength, Constr. Build. Mater. 218 (2019) 295–307. https://doi.org/10.1016/j.conbuildmat.2019.05.125.

[365] AASHTO T361, AASHTO T 361 : Standard Method of Test for Determining Asphalt Binder Bond Strength by Means of the Binder Bond Strength (BBS) Test, 2016.

[366] F. Canestrari, F. Cardone, A. Graziani, F.A. Santagata, H.U. Bahia, Adhesive and cohesive properties of asphalt-aggregate systems subjected to moisture damage, Road Mater. Pavement Des. 11 (2010) 11–32. https://doi.org/10.1080/14680629.2010.9690325.

[367] A. Graziani, A. Virgili, F. Cardone, Testing the bond strength between cold bitumen emulsion composites and aggregate substrate, Mater. Struct. Constr. 51 (2018) 1–11. https://doi.org/10.1617/s11527-018-1139-6.

[368] J.P. Aguiar-Moya, J. Salazar-Delgado, A. Baldi-Sevilla, F. Leiva-Villacorta, L. Loria-Salazar, Effect of aging on adhesion properties of asphalt mixtures with the use of bitumen bond strength and surface energy measurement tests, Transp. Res. Rec. 2505 (2015) 57–65. https://doi.org/10.3141/2505-08.

[369] A. Jamshidi, B. Golchin, M.O. Hamzah, P. Turner, Selection of type of warm mix

asphalt additive based on the rheological properties of asphalt binders, J. Clean. Prod. 100 (2015) 89–106. https://doi.org/10.1016/j.jclepro.2015.03.036.

[370] Z. Zhang, J. Tao, B. Yang, N. Li, Methodology of Mixing and Compaction Temperatures for Modified Asphalt Mixture, in: Road Pavement Mater. Charact. Rehabil. GeoHunan Int. Conf., American Society of Civil Engineers (ASCE), 2009: pp. 34–41. https://doi.org/10.1061/41043(350)5.

[371] ASTM, ASTM D2493 / D2493M - 16 Standard Practice for Viscosity-Temperature Chart for Asphalt Binders, West Conshohocken, PA, 2016. https://doi.org/10.1520/D2493_D2493M-16.

[372] A. Almusawi, B. Sengoz, A. Topal, Evaluation of mechanical properties of different asphalt concrete types in relation with mixing and compaction temperatures, Constr. Build. Mater. 268 (2021) 121140. https://doi.org/10.1016/j.conbuildmat.2020.121140.

[373] N. Izzi, F. Mohd, V. Hung, M. Rosli, G.D. Airey, Modelling the rheological properties of bituminous binders using mathematical equations, Constr. Build. Mater. 40 (2013) 174–188. https://doi.org/10.1016/j.conbuildmat.2012.09.105.

[374] P. Caputo, A.A. Abe, V. Loise, M. Porto, P. Calandra, R. Angelico, C.O. Rossi, The Role of Additives in Warm Mix Asphalt Technology : An Insight into Their Mechanisms of Improving an Emerging Technology, Nanomaterials 10 (2020) 1–17.

[375] B. Showkat, S.N. Suresha, N. Akhandappagol, Study of Rheological and Creep Recovery Properties of Asphalt Binder Modified with Waste Toner, J. Mater. Civ. Eng. 32 (2020) 1–16. https://doi.org/10.1061/(asce)mt.1943-5533.0003411.

[376] G. Ferrotti, D. Ragni, X. Lu, F. Canestrari, Effect of warm mix asphalt chemical additives on the mechanical performance of asphalt binders, Mater. Struct. Constr. 50 (2017) 1–13. https://doi.org/10.1617/s11527-017-1096-5.

[377] R. Zhang, A.R. Moshfeghi, F. Zhou, D. (Deb) Mishra, Effect of chemical warm-mix

additives on asphalt binder rheological and chemical properties in the context of aging, Constr. Build. Mater. 393 (2023) 132061. https://doi.org/10.1016/j.conbuildmat.2023.132061.

[378] M.S. Roopashree, D. Singh, B. Showkat, Influence of Same-Grade Asphalt Binder from Different Sources and Aging on Moisture Damage Characteristics of Asphalt–Aggregate System, J. Mater. Civ. Eng. 34 (2022) 1–14. https://doi.org/10.1061/(asce)mt.1943-5533.0004308.

[379] J. Marvillet, P. Bougault, Workability of bituminous mixes--development of a workability meter (with discussion), Assoc. Asph. Paving Technol. Proc. 48 (1979) 97–110.

[380] J.M. Gudimettla, L.A. Cooley, E.R. Brown, Workability of hot-mix asphalt, Transp. Res. Rec. (2004) 229–237. https://doi.org/10.3141/1891-27.

[381] S.M. Khalil, M.Y. Abdul Rahman, A.K. Arsha, Development of workability measuring device for asphalt mixture using transducer by means of energy and temperature regulator, Eur. J. Sci. Res. 51 (2011) 396–405.

[382] A. Diab, Z. You, A Bitumen-Based Prototype to Predict the Workability of Asphalt Concrete Mixtures, in: Int. Congr. Exhib. "Sustainable Civ. Infrastructures Innov. Infrastruct. Geotechnol., 2018: pp. 14–30. https://doi.org/10.1007/978-3-319-61908-8_2.

[383] W.S. Mogawer, A.J. Austerman, R. Bonaquist, Evaluating Effects of Warm-Mix Asphalt Technology Additive Dosages on Workability and Durability of Asphalt Mixtures Containing Recycled Asphalt Pavement, in: Transp. Res. Board 88th Annu. Meet., Washington DC, United States, 2009.

[384] K.D. Huang, S.C. Tzeng, Development of a hybrid pneumatic-power vehicle, Appl. Energy 80 (2005) 47–59. https://doi.org/10.1016/j.apenergy.2004.02.006.

[385] A. Shenoy, Determination of the Temperature for Mixing Aggregates with Polymer-Modified Asphalts, Int. J. Pavement Eng. 2 (2001) 33–47. https://doi.org/10.1080/10298430108901715.

[386] R. Delgadillo, H.U. Bahia, Effects of Temperature and Pressure on Hot Mixed Asphalt Compaction: Field and Laboratory Study, J. Mater. Civ. Eng. 20 (2008) 440–448. https://doi.org/10.1061/(asce)0899-1561(2008)20:6(440).

[387] R. Velasquez, G. Cuciniello, D. Swiertz, R. Bonaquist, H. Bahia, Methods to Evaluate Aggregate Coating for Asphalt Mixtures Produced at WMA Temperatures, CTAA Annu. Conf. Proceedings-Canadian Tech. Asph. Assoc. 5 (2012) 225.

[388] MoRTH, Specifications for Road and Bridge Works, Indian Roads Congr. Behalf Govet. India, Minist. Road Transp. Highw. 1 (2013) 1–883.

[389] IRC, IRC SP 101: Guidelines For Warm Mix Asphalt, Indian Road Congr. (2019).

[390] H. Källén, A. Heyden, K. Åström, P. Lindh, Measurement of bitumen coverage of stones for road building, based on digital image analysis, in: Proc. IEEE Work. Appl. Comput. Vis., 2012: pp. 337–344. https://doi.org/10.1109/WACV.2012.6163036.

[391] A. Sahari Moghaddam, E. Rezazadeh Azar, Y. Mejias, H. Bell, Estimating Stripping of Asphalt Coating Using k-Means Clustering and Machine Learning–Based Classification, J. Comput. Civ. Eng. 34 (2020) 04019044. https://doi.org/10.1061/(asce)cp.1943-5487.0000864.

[392] A. Riekstins, V. Haritonovs, A. Balodis, Evaluation of adhesion between bitumen and aggregate with the digital image processing method, IOP Conf. Ser. Mater. Sci. Eng. 660 (2019). https://doi.org/10.1088/1757-899X/660/1/012047.

[393] D. Chen, D. Chen, Evaluating asphalt pavement surface texture using 3D digital imaging, 8436 (2020). https://doi.org/10.1080/10298436.2018.1483503.

[394] L. Bruno, G. Parla, C. Celauro, Image analysis for detecting aggregate gradation in

asphalt mixture from planar images, 28 (2012) 21–30. https://doi.org/10.1016/j.conbuildmat.2011.08.007.

[395] AASHTO, AASHTO T 166 : Standard Method of Test for Bulk Specific Gravity (Gmb) of Compacted Asphalt Mixtures Using Saturated Surface-Dry Specimens, 2016.

[396] AASHTO, AASHTO T 209 : Standard Method of Test for Theoretical Maximum Specific Gravity (Gmm) and Density of Asphalt Mixtures, 2020.

[397] Government of India, Road Accidents in India-2018, Minist. Road Transp. Highw. Transp. Res. WIng 33 (2019) 75–79. www.morth.nic.in.

[398] L. Rapoport, V. Leshchinsky, I. Lapsker, Y. Volovik, O. Nepomnyashchy, M. Lvovsky, R. Popovitz-Biro, Y. Feldman, R. Tenne, Tribological properties of WS2 nanoparticles under mixed lubrication, Wear 255 (2003) 785–793. https://doi.org/10.1016/S0043-1648(03)00044-9.

[399] H. Xie, B. Jiang, B. Liu, Q. Wang, J. Xu, F. Pan, An Investigation on the Tribological Performances of the SiO2/MoS2 Hybrid Nanofluids for Magnesium Alloy-Steel Contacts, Nanoscale Res. Lett. 11 (2016). https://doi.org/10.1186/s11671-016-1546-y.

[400] S. Kar, B.B. Sahu, H. Kousaka, J.G. Han, M. Hori, Study of the effect of normal load on friction coefficient and wear properties of CNxthin films, AIP Adv. 10 (2020). https://doi.org/10.1063/5.0009783.

[401] R. Ma, D. Xiong, F. Miao, J. Zhang, Y. Peng, Friction properties of novel PVP/PVA blend hydrogels as artificial cartilage, J. Biomed. Mater. Res. - Part A 93 (2010) 1016–1019. https://doi.org/10.1002/jbm.a.32552.

[402] S. Gao, L.H. Yang, Y. Gan, Q. Chen, The Influence of Sliding Speed on the Friction Behavior of Silica Surface, ACS Omega 6 (2021) 3384–3389. https://doi.org/10.1021/acsomega.0c05897.

[403] W.O. Rosa, F. Vereda, J. de Vicente, Tribological behavior of glycerol/water-based

magnetorheological fluids in PMMA point contacts, Front. Mater. 6 (2019). https://doi.org/10.3389/fmats.2019.00032.

[404] C. Feng, D. Zhang, K. Chen, Y. Guo, Study on viscoelastic friction and wear between friction linings and wire rope, Int. J. Mech. Sci. 142–143 (2018) 140–152. https://doi.org/10.1016/j.ijmecsci.2018.04.046.

[405] N. Myshkin, A. Kovalev, Adhesion and friction of polymers and polymer composites, 2018. https://doi.org/10.1142/9789813227798_0001.

[406] K. Viswanathan, N.K. Sundaram, Distinct stick-slip modes in adhesive polymer interfaces, Wear 376–377 (2017) 1271–1278. https://doi.org/10.1016/j.wear.2016.12.017.

[407] B. Aktas, Ş. Aytekin, Ş. Aslan, Effects of Selected Warm Mix Asphalt Additives on Viscosity Properties of Binder, Acad. Perspect. Procedia 1 (2018) 80–84. https://doi.org/10.33793/ACPERPRO.01.01.19.

[408] T. Rahman, A. Dawson, N. Thom, Warm mix asphalt (WMA) for rapid construction in airfield pavement, Constr. Build. Mater. 246 (2020) 118411. https://doi.org/10.1016/j.conbuildmat.2020.118411.

[409] M.M. Mukaka, Statistics Corner : A guide to appropriate use of Correlation coefficient in medical research, 24 (2012) 69–71.

[410] J.J. Montaño Moreno, A. Palmer Pol, A. Sesé Abad, B. Cajal Blasco, El índice R-MAPE como medida resistente del ajuste en la previsiońn, Psicothema 25 (2013) 500–506. https://doi.org/10.7334/psicothema2013.23.

[411] W.S. University, L.T.R. Center, P.S. University—Altoona, Long-Term Field Performance of Warm Mix Asphalt Technologies, 2017. https://doi.org/10.17226/24708.

[412] B. Singh, N. Saboo, P. Kumar, Effect of Short-Term Aging on Creep and Recovery

Response of Asphalt Binders, J. Transp. Eng. Part B Pavements 143 (2017) 04017017. https://doi.org/10.1061/jpeodx.0000018.

[413] A. Julaganti, R. Choudhary, A. Kumar, Permanent Deformation Characteristics of Warm Asphalt Binders under Reduced Aging Conditions, KSCE J. Civ. Eng. 23 (2019) 160–172. https://doi.org/10.1007/s12205-017-1903-0.

[414] Warm Mix Asphalt Technologies and Research - WMA - Sustainability - Pavements - Federal Highway Administration, (n.d.). https://www.fhwa.dot.gov/pavement/asphalt/wma.cfm (accessed January 12, 2022).

[415] S. Zhao, B. Huang, X. Shu, X. Jia, M. Woods, Laboratory performance evaluation of warm-mix asphalt containing high percentages of reclaimed asphalt pavement, Transp. Res. Rec. (2012) 98–105. https://doi.org/10.3141/2294-11.

[416] S. Xu, F. Xiao, S. Amirkhanian, D. Singh, Moisture characteristics of mixtures with warm mix asphalt technologies – A review, Constr. Build. Mater. 142 (2017) 148–161. https://doi.org/10.1016/j.conbuildmat.2017.03.069.

[417] F. Xiao, J. Jordan, S.N. Amirkhanian, Laboratory investigation of moisture damage in warm-mix asphalt containing moist aggregate, Transp. Res. Rec. (2009) 115–124. https://doi.org/10.3141/2126-14.

[418] A. Behnood, M.M. Karimi, G. Cheraghian, Coupled effects of warm mix asphalt (WMA) additives and rheological modifiers on the properties of asphalt binders, Clean. Eng. Technol. 1 (2020) 100028. https://doi.org/10.1016/J.CLET.2020.100028.

[419] Q. Li, G. Sun, Y. Lu, Y. Meng, S. Luo, L. Gao, Effects of warm-mix asphalt technologies and modifiers on pavement performance of recycled asphalt binders, J. Clean. Prod. 282 (2021) 125435. https://doi.org/10.1016/J.JCLEPRO.2020.125435.

[420] B.V. Kök, M. Akpolat, Effects of Using Sasobit and SBS on the Engineering Properties of Bitumen and Stone Mastic Asphalt, J. Mater. Civ. Eng. 27 (2015) 04015006.

https://doi.org/10.1061/(ASCE)MT.1943-5533.0001255/ASSET/68BB868C-27FB-4A32-94E3-C7045D909D44/ASSETS/IMAGES/LARGE/FIGURE9.JPG.

[421] M. Harooni Jamaloei, M. Aboutalebi Esfahani, M. Filvan Torkaman, Rheological and Mechanical Properties of Bitumen Modified with Sasobit, Polyethylene, Paraffin, and Their Mixture, J. Mater. Civ. Eng. 31 (2019). https://doi.org/10.1061/(ASCE)MT.1943-5533.0002664.

[422] G. Prakash, S.K. Suman, Rutting characteristics evaluation and prediction model development for warm mix asphalt, Int. J. Pavement Eng. 24 (2023). https://doi.org/10.1080/10298436.2023.2165656.

[423] F. Zaremotekhases, H. Sadek, M. Hassan, C. Berryman, Impact of warm-mix asphalt technologies and high reclaimed asphalt pavement content on the performance of alternative asphalt mixtures, Constr. Build. Mater. 319 (2022) 126035. https://doi.org/10.1016/j.conbuildmat.2021.126035.

[424] A. Behl, G.B. Satish, Characterization of Fatigue Resistance of Warm Mix Binders Using Linear Amplitude Sweep Test, Int. J. Pavement Res. Technol. (2021). https://doi.org/10.1007/s42947-021-00031-3.

[425] N. Norouzi, A. Ameli, R. Babagoli, Investigation of fatigue behaviour of warm modified binders and warm-stone matrix asphalt (WSMA) mixtures through binder and mixture tests, Int. J. Pavement Eng. 22 (2021) 1042–1051. https://doi.org/10.1080/10298436.2019.1659262.

[426] T.A. Ahmed, H. David, R.C. Williams, ScienceDirect Using a modified asphalt bond strength test to investigate the properties of asphalt binders with poly ethylene wax-based warm mix asphalt additive, Int. J. Pavement Res. Technol. 11 (2018) 28–37. https://doi.org/10.1016/j.ijprt.2017.08.004.

[427] M. Sukhija, N. Saboo, A.K. Yadav, C. Rath, Laboratory study on the suitability of nano-

silica as a modifier for asphalt binders, Constr. Build. Mater. 302 (2021) 124406. https://doi.org/10.1016/j.conbuildmat.2021.124406.

[428] S.A. Asif, N. Ahmed, A. Hayat, S. Hussan, F. Shabbir, K. Mehmood, Study of adhesion characteristics of different bitumen–aggregate combinations using bitumen bond strength test, J. Chinese Inst. Eng. Trans. Chinese Inst. Eng. A 41 (2018) 430–440. https://doi.org/10.1080/02533839.2018.1490205.

[429] S.M. Wang, J.R. Chang, R.C.C. Tsiang, Infrared studies of thermal oxidative degradation of polystyrene-block-polybutadiene-block-polystyrene thermoplastic elastomers, Polym. Degrad. Stab. 52 (1996) 51–57. https://doi.org/10.1016/0141-3910(95)00226-X.

[430] D. Singh, S. Girimath, P.K. Ashish, Performance Evaluation of Polymer-Modified Binder Containing Reclaimed Asphalt Pavement Using Multiple Stress Creep Recovery and Linear Amplitude Sweep Tests, J. Mater. Civ. Eng. 30 (2018) 04018004. https://doi.org/10.1061/(asce)mt.1943-5533.0002176.

[431] D. Singh, A. V. Kataware, Comparison of different rheological parameters for rutting susceptibility of SBS + WMA modified binders, Innov. Infrastruct. Solut. 1 (2016) 1–10. https://doi.org/10.1007/S41062-016-0026-7/FIGURES/8.

[432] M. Yue, J. Yue, R. Wang, Y. Xiong, Evaluating the fatigue characteristics and healing potential of asphalt binder modified with Sasobit® and polymers using linear amplitude sweep test, Constr. Build. Mater. 289 (2021). https://doi.org/10.1016/j.conbuildmat.2021.123054.

[433] G. Guduru, A.K. Goli, S. Matolia, K.K. Kuna, Chemical and Performance Characteristics of Rejuvenated Bituminous Materials with High Reclaimed Asphalt Content, 33 (2021) 1–13. https://doi.org/10.1061/(ASCE)MT.1943-5533.0003540.

[434] M. Sabouri, D. Mirzaiyan, A. Moniri, Effectiveness of Linear Amplitude Sweep (LAS

) asphalt binder test in predicting asphalt mixtures fatigue performance, Constr. Build. Mater. 171 (2018) 281–290. https://doi.org/10.1016/j.conbuildmat.2018.03.146.

[435] H. Al Hawesah, M. Sadique, C. Harris, H. Al Nageim, K. Stopp, H. Pearl, Polymer modified asphalt binder–an approach for enhancing temperature sensitivity for emergency pavement repair, Int. J. Pavement Eng. 23 (2022) 4760–4774. https://doi.org/10.1080/10298436.2021.1975704.

[436] D.M. Abd, H. Al-Khalid, R. Akhtar, An investigation into the impact of warm mix asphalt additives on asphalt mixture phases through a nano-mechanical approach, Constr. Build. Mater. 189 (2018) 296–306. https://doi.org/10.1016/j.conbuildmat.2018.08.165.

[437] F.H. Khairuddin, M.Y. Alamawi, N.I.M. Yusoff, K.H. Badri, H. Ceylan, S.N.M. Tawil, Physicochemical and thermal analyses of polyurethane modified bitumen incorporated with Cecabase and Rediset: Optimization using response surface methodology, Fuel 254 (2019) 115662. https://doi.org/10.1016/j.fuel.2019.115662.

[438] W. Song, B. Huang, X. Shu, Influence of warm-mix asphalt technology and rejuvenator on performance of asphalt mixtures containing 50% reclaimed asphalt pavement, J. Clean. Prod. 192 (2018) 191–198. https://doi.org/10.1016/j.jclepro.2018.04.269.

[439] D. Singh, P. Kumar, S.F. Chitragar, Laboratory performance of Recycled Asphalt Mixes containing wax and chemical based Warm Mix Additives using Semi Circular Bending and Tensile Strength Ratio tests, Constr. Build. Mater. 158 (2018) 1003–1014. https://doi.org/10.1016/j.conbuildmat.2017.10.080.

[440] G. Prakash, S.K. Suman, An intensive overview of warm mix asphalt (WMA) technologies towards sustainable pavement construction, Innov. Infrastruct. Solut. 7 (2022). https://doi.org/10.1007/s41062-021-00712-9.

[441] Z. You, J. Mills-Beale, E. Fini, S.W. Goh, B. Colbert, Evaluation of Low-Temperature

Binder Properties of Warm-Mix Asphalt, Extracted and Recovered RAP and RAS, and Bioasphalt, J. Mater. Civ. Eng. 23 (2011) 1569–1574. https://doi.org/10.1061/(asce)mt.1943-5533.0000295.

[442] Y. Ali, M. Irfan, S. Ahmed, S. Khanzada, T. Mahmood, Investigation of factors affecting dynamic modulus and phase angle of various asphalt concrete mixtures, Mater. Struct. (2016) 857–868. https://doi.org/10.1617/s11527-015-0544-3.

[443] M. Irfan, M. Saeed, S. Ahmed, Y. Ali, Performance Evaluation of Elvaloy as a Fuel-Resistant Polymer in Asphaltic Concrete Airfield Pavements, J. Mater. Civ. Eng. 29 (2017) 1–9. https://doi.org/10.1061/(asce)mt.1943-5533.0002018.

[444] M.A. Khasawneh, M. Taamneh, A.A. Al-omari, T. Harahsheh, A. Al-hosainat, Experimental and Statistical Evaluation of Asphalt Binders Produced in Jordan Treated with Different Modifiers, 32 (2020). https://doi.org/10.1061/(ASCE)MT.1943-5533.0003003.

[445] S. Wu, L. Pang, G. Liu, J. Zhu, Laboratory Study on Ultraviolet Radiation Aging of Bitumen, J. Mater. Civ. Eng. 22 (2010) 767–772. https://doi.org/10.1061/(asce)mt.1943-5533.0000010.

[446] S. Wu, Z. Zhao, Y. Xiao, M. Yi, Z. Chen, M. Li, Evaluation of mechanical properties and aging index of 10-year field aged asphalt materials, Constr. Build. Mater. 155 (2017) 1158–1167. https://doi.org/10.1016/j.conbuildmat.2017.08.102.

[447] N. Tang, W. Huang, G. Hao, Effect of aging on morphology, rheology, and chemical properties of highly polymer modified asphalt binders, Constr. Build. Mater. 281 (2021) 122595. https://doi.org/10.1016/j.conbuildmat.2021.122595.

[448] M. Akpolat, Investigation of rutting, fatigue and cracking resistance parameters of CR modified warm asphalt binders compare with SBS modified binders, Rev. La Constr. 21 (2022) 309–328. https://doi.org/10.7764/RDLC.21.2.309.

[449] M.E. Abdullah, K.A. Zamhari, M.K. Shamshudin, M.R. Hainin, M.K.I.M. Satar, Rheological properties of asphalt binder modified with chemical warm asphalt additive, Adv. Mater. Res. 671–674 (2013) 1692–1699. https://doi.org/10.4028/www.scientific.net/AMR.671-674.1692.

[450] B. Sengoz, A. Topal, C. Gorkem, Evaluation of natural zeolite as warm mix asphalt additive and its comparison with other warm mix additives, Constr. Build. Mater. 43 (2013) 242–252. https://doi.org/10.1016/j.conbuildmat.2013.02.026.

[451] S.K. Mahto, S. Sinha, Moisture Susceptibility of Warm-Mix Asphalt Containing Wax- and Chemical-Based Additives, J. Transp. Eng. Part B Pavements 150 (2024) 1–17. https://doi.org/10.1061/jpeodx.pveng-1357.

[452] M. Fallah Tafti, M.M. Khabiri, H. Khani Sanij, Experimental investigation of the effect of using different aggregate types on WMA mixtures, Int. J. Pavement Res. Technol. 9 (2016) 376–386. https://doi.org/10.1016/j.ijprt.2016.09.006.

[453] M. Sukhija, N. Saboo, A. Pani, Suitability of warm mix asphalt (WMA) technologies based on performance and energy consumption, Road Mater. Pavement Des. (2023). https://doi.org/10.1080/14680629.2023.2268721.