

**References:**

1. A.B. Peters, D. Zhang, S. Chen, C. Ott, C. Oses, S. Curtarolo, I. McCue, T. Pollock, S.E. Prameela, Materials design for hypersonics. <https://arxiv.org/pdf/2309.04053.pdf>. (accessed in Nov 2023)
2. A.D. Cato, D.D. Edie, Flow behaviour of mesophase pitch, *Carbon* 41 (2003) 1411-1417. [https://doi.org/10.1016/S0008-6223\(03\)00050-2](https://doi.org/10.1016/S0008-6223(03)00050-2).
3. A.J. Moorhead, W.H. Elliott, H.E. Kim, Brazing of ceramic and ceramic-to-metal joints, Vol. 6, ASM International, 1993. <https://doi.org/10.31399/asm.hb.v06.a0001457>.
4. A.M. Hadian, Joining of silicon nitride to silicon nitride and molybdenum for high-temperature applications, Doctoral Thesis, McGill University, 1993.
5. A.S. Skapski, A theory of surface tension of solids—I application to metals, *Acta Metall.* 4 (1956) 576-582. [https://doi.org/10.1016/0001-6160\(56\)90159-6](https://doi.org/10.1016/0001-6160(56)90159-6).
6. American Welding Society, *Welding Handbook*. Vol 2. 7th ed.; 1978.
7. C.G. Cofer, J. Economy, Oxidative and hydrolytic stability of boron nitride — A new approach to improving the oxidation resistance of carbonaceous structures, *Carbon* 33 (1995) 389–395. [https://doi.org/10.1016/0008-6223\(94\)00163-T](https://doi.org/10.1016/0008-6223(94)00163-T).
8. D.E. Glass, Ceramic Matrix Composite (CMC) Thermal Protection Systems (TPS) and Hot Structures for Hypersonic Vehicles, 15th AIAA Space Planes and Hypersonic Systems and Technologies Conference, NASA Headquarters, USA, 2007.
9. D.S. Duvall, W.A. Owczarski, D.F. Paulonis, TLP bonding: a new method for joining heat-resistant alloys. *Weld J.* (N. Y.) 53 (1974) 203-214. Accessed November 2023. <https://www.osti.gov/biblio/4295940>.
10. E. Fitzer, R. Gadow, Fibre-reinforced silicon carbide, *Bull. Am. Ceram. Soc.* 65 (1986) 368–72.
11. F. Gern, Capillarity and infiltration behaviour in the liquid siliconization of carbon/carbon components, Doctoral Thesis, University of Stuttgart, 1995.
12. G. Li, Y. Zhang, C. Zhang, H. Hu, S. Chen, Z. Zhang, Design, preparation, and properties of online joints of C/SiC–C/SiC with pins, *Compos. Part B Eng.* 48 (2013) 134-139. <https://doi.org/10.1016/j.compositesb.2012.09.093>.
13. H. Dong, S. Li, Y. Teng, W. Ma, Joining of SiC ceramic-based materials with ternary carbide  $Ti_3SiC_2$ , *Mater. Sci. Eng. B.* 176 (2011) 60-64. <https://doi.org/10.1016/j.mseb.2010.09.002>.

14. H. Hald, D. Petersen, T. Reimer, F. Ruhle, P. Winkelmann, H. Weihs, Development of a CMC-based TPS for two representative specimens of cryogenic tank of RLVs, AIAA 8th Int. Space Planes and Hypersonic Systems April 27-30 1998, Norfolk, Virginia, USA
15. H.P. Xiong, B. Chen, W. Mao, X.H. Li, Joining of C<sub>f</sub>/SiC Composite With Pd-Co-V Brazing Filler, *Weld World*. 56 (2012) 76-80. <https://doi.org/10.1007/BF03321149>.
16. H.P. Xiong, B. Chen, Y. Pan, H.S. Zhao, L. Ye, Joining of C<sub>f</sub>/SiC composite with a Cu–Au–Pd–V brazing filler and interfacial reactions, *J. Eur. Ceram. Soc.* 34 (2014) 1481-1486. <https://doi.org/10.1016/j.jeurceramsoc.2013.12.022>.
17. J. Bill, F. Aldinger, Precursor-derived Covalent Ceramics, *Adv. Mater.* 7 (1995) 775–787. <https://doi.org/10.1002/adma.19950070903>.
18. J. Kuruvilla, O. Kristiina, W. Runcy, A. Saritha, *Fiber Reinforced Composites*, 1st ed., Woodhead Publishing, United Kingdom, 2021. <https://doi.org/10.1016/C2019-0-01926-7>.
19. J. Zhang, R. Luo, M. Jiang, Q. Xiang, J. Li, The preparation and performance of a novel room-temperature-cured heat-resistant adhesive for ceramic bonding, *Mater. Sci. Eng. A*. 528 (2011) 2952-2959. <https://doi.org/10.1016/j.msea.2010.11.091>.
20. J.A. Pask, From technology to the science of Glass/Metal and Ceramic/Metal Sealing, *Ceramic Bulletin*. 66 (1987) 1587-1592.
21. J.B. Donnet, R.C. Bansal, *Carbon Fibers*, CRC Press, New York, USA, 1984.
22. J.D. Buckley, Carbon-carbon: An overview, *American Ceramic Society Bulletin* 67 (1988) 364-8.
23. J.H. Kweon, J.W. Jung, T.H. Kim, J.H. Choi, D.H. Kim, Failure of carbon composite-to-aluminum joints with combined mechanical fastening and adhesive bonding, *Compos. Struct.* 75 (2006) 192-198. <https://doi.org/10.1016/j.compstruct.2006.04.013>.
24. J.H. Vickers, L.C. Tate, S.W. Gaddis, R.E. Neal, Composites materials and manufacturing technologies for space applications, Proceedings of a NASA-sponsored technical interchange conference held in New Orleans, Louisiana, May 6–7, 2015.
25. J.V. Naidich, The Wettability of Solids by Liquid Metals, *Prog. Surf. Membr. Sci.* 14 (1981) 353-484. <https://doi.org/10.1016/B978-0-12-571814-1.50011-7>.
26. K. Mergia, Joining of C<sub>f</sub>/C and C<sub>f</sub>/SiC Composites to Metals, *Intech Open* 2011. <https://doi.org/10.5772/18229>.

27. K. Pingkarawat, C.H. Wang, R.J. Varley, A.P. Mouritz, Healing of fatigue delamination cracks in carbon–epoxy composite using mendable polymer stitching, *J. Intell. Mater. Syst. Struct.* 25 (2014) 75-86. <https://doi.org/10.1177/1045389X13505005> .
28. K.K. Chawla, *Ceramic Matrix Composites*. Springer US; 2003. <https://doi.org/10.1007/978-1-4615-1029-1>
29. L. Silvestroni, D. Sciti, L. Esposito, A.M. Glaeser, Joining of ultra-refractory carbides, *J. Eur. Ceram. Soc.* 32 (2012) 4469-4479. <https://doi.org/10.1016/j.jeurceramsoc.2012.07.019>.
30. L.A. Baldwin, L.M. Rueschhoff, J.R. Deneault, K.S. Cissel, P. Nikolaev, M.K. Cinibulk, H. Koerner, M.J. Dalton, M.B. Dickerson, Synthesis of a Two-Component Carbosilane System for the Advanced Manufacturing of Polymer-Derived Ceramics, *Chem. Mater.* 30 (2018) 7527–7534. <https://doi.org/10.1021/acs.chemmater.8b02541>.
31. M. Belardo, R. Gardi, Conceptual design of the junction between C/SiC thermal protection system and anisogrid fuselage cold structure, *Procedia Eng.* 114 (2015) 46-53. <https://doi.org/10.1016/j.proeng.2015.08.033>.
32. M. Salvo, M. Ferraris, P. Lemoine, M.M. Appendino, M. Merola, Joining of CMCs for thermonuclear fusion applications, *J. Nucl. Mater.* 233-237 (1996) 949-953. [https://doi.org/10.1016/S0022-3115\(96\)00148-1](https://doi.org/10.1016/S0022-3115(96)00148-1).
33. M. Scheffler, R. Bordia, N. Travitzky, P. Greil, Development of a rapid crosslinking preceramic polymer system, *J. Eur. Ceram. Soc.* 25 (2005) 175–180. <https://doi.org/10.1016/j.jeurceramsoc.2004.07.013>.
34. M. Schwartz, *Encyclopedia of materials, parts, and finishes*, 2nd ed., CRC Press, New York, USA, 2002.
35. M. Trinquescoste, J.L. Carlier, A. Derrb, P. Delhaes, P. Chadeyron, High temperature thermal and mechanical properties of high tensile carbon single filaments, *Carbon* 34 (1996) 923-929. [https://doi.org/10.1016/0008-6223\(96\)00052-8](https://doi.org/10.1016/0008-6223(96)00052-8).
36. M.G. Nicholas, *Joining Processes : Introduction to Brazing and Diffusion Bonding*, Kluwer Academic Publishers, Boston, 1998.
37. M.G. Nicholas, S.D. Peteves, Reactive joining; chemical effects on the formation and properties of brazed and diffusion bonded interfaces, *Scr. Metall. Mater.* 31 (1994) 1091-1096. [https://doi.org/10.1016/0956-716X\(94\)90532-0](https://doi.org/10.1016/0956-716X(94)90532-0).
38. N.P. Bansal, J. Lamon, *Ceramic Matrix Composites: Materials, Modeling and Technology*, John Wiley & Sons, New Jersey, USA, 2014.

- 
39. N.V. Moutis, C. Jimenez, X. Azpiroz, T. Speliotis, C. Wilhelmi, S. Messoloras, K. Mergia, Brazing of carbon–carbon composites to Nimonic alloys, *J. Mater. Sci.* 45 (2010) 74–81. <https://doi.org/10.1007/s10853-009-3893-x>.
  40. O. Uyanna, H. Najafi, Thermal protection systems for space vehicles: A review on technology development, current challenges and future prospects, *Acta Astronaut.* 176 (2020) 341–356. <https://doi.org/10.1016/j.actaastro.2020.06.047>.
  41. P. Colombo, G. Mera, R. Riedel, G.D. Soraru, Polymer-Derived Ceramics: 40 Years of Research and Innovation in Advanced Ceramics, *J. Am. Ceram. Soc.* 93 (2010) 1805–1837. <https://doi.org/10.1111/j.1551-2916.2010.03876.x>.
  42. P.K. Gianchandani, V. Casalegno, F. Smeacetto, M. Ferraris, Pressure-less joining of C/SiC and SiC/SiC by a MoSi<sub>2</sub>/Si composite, *Int. J. Appl. Ceram. Technol.* 14 (2017) 305–312. <https://doi.org/10.1111/ijac.12631>.
  43. P.R. Chidambaram, G.R. Edwards, D.L. Olson, A thermodynamic criterion to predict wettability at metal-alumina interfaces, *Metall. Trans. B* 23 (1992) 215–222. <https://doi.org/10.1007/BF02651856>.
  44. Q. Tong, L. Cheng, Liquid Infiltration Joining of 2D C/SiC Composite, *Sci. Eng. Compos. Mater.* 13 (2006) 31–36. <https://doi.org/10.1515/SECM.2006.13.1.31>.
  45. Q. Tong, L. Cheng, Liquid infiltration joining of 2D C/SiC composite, *Sci. Eng. Compos. Mater.* 13 (2006) 31–36. <https://doi.org/10.1515/SECM.2006.13.1.31>.
  46. R. Naslain, Chemical reactivity in the processing and the interactions with the environment of ceramic matrix composites, *Solid State Ion.* 101–103 (1997) 959–973. [https://doi.org/10.1016/S0167-2738\(97\)00155-0](https://doi.org/10.1016/S0167-2738(97)00155-0).
  47. R. Naslain, Two-dimensional SiC/SiC composites processed according to the isobaric-isothermal chemical vapour infiltration gas phase route, *J. Alloys Compd.* 188 (1992) 42–48. [https://doi.org/10.1016/0925-8388\(92\)90641-L](https://doi.org/10.1016/0925-8388(92)90641-L).
  48. R.B. Heimann, *Classic and Advanced Ceramics: From Fundamentals to Applications*, WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim, Germany, 2010. <https://doi.org/10.1002/9783527630172>.
  49. Reimer T. An advanced CMC thermal protection system flight experiment on the FOTON-M2 Mission, *Advances in Aerospace Technology* 1 (2007) 277–286. <https://doi.org/10.1115/IMECE2007-43451>.
  50. S. Dalton, F. Heatley, P.M. Budd, Thermal stabilization of polyacrylonitrile fibres, *Polymer* 40 (1999) 5531–5543. [https://doi.org/10.1016/S0032-3861\(98\)00778-2](https://doi.org/10.1016/S0032-3861(98)00778-2).

51. S. Hausner, B. Wielage, Brazing of metal and ceramic joints, *Advances in Brazing* (2013) 361-393. <https://doi.org/10.1533/9780857096500.2.361>.
52. S. Kumar, A. Painuly, A. Kamal, et al. Development of C/SiC Fasteners for High-Temperature Applications, *Mater. Perform. Charact.* 10 (2021) 253-267. <https://doi.org/10.1520/MPC20200161>.
53. S. Rizzo, S. Grasso, M. Salvo, V. Casalegno, M.J. Reece, M. Ferraris, Joining of C/SiC composites by spark plasma sintering technique, *J. Eur. Ceram. Soc.* 34 (2014) 903-913. <https://doi.org/10.1016/j.jeurceramsoc.2013.10.028>.
54. S.C. Bennett, D.J. Johnson, London International Conference on Carbon and Graphite, Society of Chemical Industry, London, 1978.
55. S.J. Lee, A. Sharma, D.H. Jung, J.P. Jung, Influence of Arc Brazing Parameters on Microstructure and Joint Properties of Electro-Galvanized Steel, *Metals* 9 (2019) 1006. <https://doi.org/10.3390/met9091006>.
56. S.P.S. Arya, A. D'Amico, Preparation, properties and applications of boron nitride thin films, *Thin Solid Films* 157 (1988) 267–282. [https://doi.org/10.1016/0040-6090\(88\)90008-9](https://doi.org/10.1016/0040-6090(88)90008-9).
57. T. Ahmed, Reservoir Engineering Handbook, 5<sup>th</sup> ed., Gulf Professional Publishing, USA, 2019.
58. T.M. Besmann, B.W. Sheldon, M.D. Kaster, Temperature and concentration dependence of SiC deposition on Nicalon fibres, *Surf. Coat. Technol.* 43–44 (1990) 167–175. [https://doi.org/10.1016/0257-8972\(90\)90071-J](https://doi.org/10.1016/0257-8972(90)90071-J).
59. V.L.E. Murr, Interfacial Phenomena in Metal and Alloys, *Phys Unserer Zeit.* 8 (1977) 30-30. <https://doi.org/10.1002/piuz.19770080108>.
60. W. Krenkel, Ceramic Matrix Composites: Fibre Reinforced Ceramics and Their Applications, John Wiley & Sons, Germany, 2008.
61. W. Lippmann, J. Knorr, R. Wolf, R. Rasper, H. Exner, A.M. Reinecke, M. Nieher, R. Schreiber, Laser joining of silicon carbide - A new technology for ultra-high temperature resistant joints, *Nucl. Eng. Des.* 231 (2004) 151-161. <https://doi.org/10.1016/j.nucengdes.2004.03.002>.
62. W.B. Hillig, R.L. Mehan, C.R. Morelock, V.J. Decarlo, W. Askow, Silicon/silicon carbide composites, *Ceramic Bulletin* 54 (1975) 1054–56.
63. W.D. MacDonald, T.W. Eagar, Transient liquid phase bonding, *Annu. Rev. Mater. Sci.* 22 (1992) 23-46. <https://doi.org/10.1146/annurev.ms.22.080192.000323>.
64. W.E. Brownell, Structural Clay Products, Vol.: 9, 1st ed., Springer-Verlag Wien, 1976.

- 
65. W.R. Tyson, Surface energies of solid metals, *Can. Metall. Q.* 14 (1975) 307-314. <https://doi.org/10.1179/000844375795049997>.
66. W.W. Li, B. Chen, H.P. Xiong, W.J. Zou, H.S. Ren, Reactive brazing C<sub>f</sub>/SiC to itself and Mo using the NiPdPtAu-Cr filler alloy, *J. Eur. Ceram. Soc.* 37 (2017) 3849-3859. <https://doi.org/10.1016/j.jeurceramsoc.2017.05.025>.
67. X. Li, X. Pei, X. Zhong, G. Mo, L. He, Z. Huang, Q. Huang, Highly effective free-radical-catalyzed curing of hyperbranched polycarbosilane for near stoichiometric SiC ceramics, *J. Am. Ceram. Soc.* 102 (2019) 1041-1048. <https://doi.org/10.1111/jace.15966>.
68. X. Wang, J. Wang, H. Wang, Synthesis of a novel preceramic polymer (V-PMS) and its performance in heat-resistant organic adhesives for joining SiC ceramic, *J. Eur. Ceram. Soc.* 32 (2012) 3415-3422. <https://doi.org/10.1016/j.jeurceramsoc.2012.03.032>.
69. Y. Naidich, V.S. Zhuravlev, I.I. Gab, B.D. Kostyuk, V.P. Krasovskyy, A.A. Adamovskyy, N.Y. Taranets, Liquid metal wettability and advanced ceramic brazing, *J. Eur. Ceram. Soc.* 28 (2008) 717-728. <https://doi.org/10.1016/j.jeurceramsoc.2007.07.021>.
70. Y. Zhang, D. Feng, Z. He, X. Chen, Progress in joining ceramics to metals, *J. Iron Steel Res. Int.* 13 (2006) 1-5. [https://doi.org/10.1016/S1006-706X\(06\)60032-0](https://doi.org/10.1016/S1006-706X(06)60032-0).
71. Y. Zhang, Y. Chen, D. Yu, D. Sun, H. Li, A review paper on the effect of the welding process of ceramics and metals, *J. Mater. Res. Technol.* 9 (2020) 16214-16236. <https://doi.org/10.1016/j.jmrt.2020.11.088>.
72. Y.I. Jung, S.H. Kim, H.G. Kim, J.Y. Park, W.J. Kim, Microstructures of diffusion-bonded SiC ceramics using Ti and Mo interlayers, *J. Nucl. Mater.* 441 (2013) 510-513. <https://doi.org/10.1016/j.jnucmat.2013.07.008>.
73. Z. Bashir, A critical review of the stabilization of polyacrylonitrile, *Carbon* 29 (1991) 1081-1090. [https://doi.org/10.1016/0008-6223\(91\)90024-D](https://doi.org/10.1016/0008-6223(91)90024-D).
74. Z. He, L. Zhang, Y. Zhang, Y. Liu, X. Liu, B. Chen, Microstructural characterization and failure analysis of 2D C/SiC two-layer beam with pin-bonded hybrid joints, *Int. J. Adhes. Adhes.* 57 (2015) 70-78. <https://doi.org/10.1016/j.ijadhadh.2014.10.008>.

## References

1. A.J. Heidloff, V. Sluytman, T.M. Pollock, B. Gleeson, Structural Stability of Platinum-Group-Metal-Modified  $\gamma + \gamma'$  Ni-Base Alloys, *Metall. Mater. Trans. A.* 40 (2009) 1529-1540. <https://doi.org/10.1007/s11661-009-9844-y>.
2. B. Chen, H. Xiong, X. Wu, Y. Cheng, W. Mao, Joining of C<sub>f</sub>/SiC composite with AuNi(Cu)-Cr brazing fillers and interfacial reactions, *Weld World.* 60 (2016) 813-819. <https://doi.org/10.1007/s40194-016-0339-3>.
3. B. Cui, J.H. Huang, C. Cai, S. Chen, X. Zhao, Microstructures and mechanical properties of C<sub>f</sub>/SiC composite and TC4 alloy joints brazed with (Ti-Zr-Cu-Ni)+W composite filler materials, *Compos. Sci. Technol.* 97 (2014) 19-26. <http://dx.doi.org/10.1016/j.compscitech.2014.03.021>.
4. B. Riccardi, C.A. Nannetti, J. Woltersdorf, E. Pippel, T. Petrisor, Brazing of SiC and SiC<sub>f</sub>/SiC composites performed with 84Si-16Ti eutectic alloy: Microstructure and strength, *J. Mater. Sci.* 37 (2002) 5029-5039. <https://doi.org/10.1023/A:1021087632155>.
5. B. Riccardi, C.A. Nannetti, J. Woltersdorf, E. Pippel, T. Petrisor, Joining of SiC based ceramics and composites with Si-16Ti and Si-18Cr eutectic alloys, *Int. J. Mater. Prod. Technol.* 20 (2004) 440-451.
6. B. Tang, M.C. Wang, R.M. Liu, H. Du., A. Duo, A heat-resistant preceramic polymer with broad working temperature range for silicon carbide joining, *J. Eur. Ceram. Soc.* 38 (2018) 67-74. <https://doi.org/10.1016/j.jeurceramsoc.2017.08.033>.
7. B. Zhou, K. Feng, H. Zhou, Joining of SiC ceramic by using the liquid polyvinylphenylsiloxane, *Adv. Appl. Ceram.* 117 (2018) 212-216. <https://doi.org/10.1080/17436753.2017.1392069>.
8. B. Zhou, T. Li, H. Zhang, J. Hou, Microstructure and properties of SiC ceramic brazed with Zr-Cu composite filler metal, *RSC Adv.* 11 (2021) 26949-26954. <https://doi.org/10.1039/D1RA03021C>.
9. B. Gottselig, E. Gyarmati, A. Naoumidis, H. Nickel, Joining of ceramics demonstrated by the example of SiC/Ti, *J. Eur. Ceram. Soc.* 6 (1990) 153-160. [https://doi.org/10.1016/0955-2219\(90\)90012-5](https://doi.org/10.1016/0955-2219(90)90012-5).
10. B.V. Cockeram, Flexural strength and shear strength of silicon carbide to silicon carbide joints fabricated by a molybdenum diffusion bonding technique, *J. Am. Ceram. Soc.* 88 (2005) 1892-1899. <https://doi.org/10.1111/j.1551-2916.2005.00381.x>.

11. D. Fan, C. Li, J. Huang, J. Yang, B. Cui, W. Wang, A novel composite-diffusion brazing process based on transient liquid phase bonding of a C<sub>f</sub>/SiC composite to Ti-6Al-4V, *Ceram. Int.* 43 (2017) 13009–13012. <https://doi.org/10.1016/j.ceramint.2017.06.044>
12. D.Y. Fan, J.H. Huang, X.P. Zhao, J. Yang, S. Chen, X. Zhao, Joining of C<sub>f</sub>/SiC composite to Ti-6Al-4V with (Ti-Zr-Cu-Ni)+Ti filler based on in-situ alloying concept, *Ceram. Int.* 43 (2017) 4151–4158. <https://doi.org/10.1016/j.ceramint.2016.12.030>.
13. F. Valenza, S. Gambaro, M.L. Muolo, M. Salvo, V. Casalegno, Wetting of SiC by Al–Ti alloys and joining by in-situ formation of interfacial Ti<sub>3</sub>Si(Al)C<sub>2</sub>. *J. Eur. Ceram. Soc.* 38 (2018) 3727–3734. <https://doi.org/10.1016/j.jeurceramsoc.2018.04.025>.
14. G.B. Lin, J.H. Huang, H. Zhang, H.Y. Liu, Microstructure and mechanical performance of brazed joints of C<sub>f</sub>/ SiC composite and Tialloy using Ti-Cu-Ag-W, *Sci. Technol. Weld. Join.* 11 (2006) 379-383. <https://doi.org/10.1179/174329306X113235>.
15. G.B. Lin, J.H. Huang, H. Zhang, Joints of carbon fibre reinforced SiC composites to Ti-alloy brazed by Ti-Cu-Ag short carbon fibres, *J. Mater. Process. Technol.* 189 (2007) 256–261. <https://doi.org/10.1016/j.jmatprotec.2007.01.031>.
16. H. Ban, J.H. Huang, H. Zhang et al., Microstructure of reactive composite brazing joints of C/SiC composite to Ti- 6Al-4V alloy with Cu-Ti-C filler material,” *Rare Metal Mat. Eng.* 38 (2009) 713–716.
17. H. Dong, S. Li, Y. Teng, W. Ma, Joining of SiC ceramic-based materials with ternary carbide Ti<sub>3</sub>SiC<sub>2</sub>, *Mater. Sci. Eng. B.* 76 (2011) 60-64. <https://doi.org/10.1016/j.mseb.2010.09.002>.
18. H. Yu, Y. Wang, Y. Jing, J. Ma, C.F. Du, Q. Yan, Surface modified mXene-based nanocomposites for electrochemical energy conversion and storage, *MXene-Based Nanocomposites* (2019), <https://doi.org/10.1002/sml.201901503>.
19. H.E. Khalifa, T. Koyanagi, G.M. Jacobsen, C.P. Deck, C.A. Back, Radiation stable, hybrid, chemical vapor infiltration/preceramic polymer joining of silicon carbide components, *J. Nucl. Mater.* 487 (2017) 91–95. <http://dx.doi.org/10.1016/j.jnucmat.2017.02.012>.
20. H.L. Liu, C.Y. Tian, M.Z. Wu, Technique of joining of C<sub>f</sub>/SiC composite via preceramic silicone polysilazane and joining properties, *Chinese Journal of Nonferrous Metals* 18 (2008) 278–281.
21. H.P. Xiong, B. Chen, W. Mao, X.H. Li, Joining of C<sub>f</sub>/SiC Composite With Pd-Co-V Brazing Filler. *Weld World.* 56 (2012) 76-80. <https://doi.org/10.1016/10.1007/BF03321149>.

22. H.P. Xiong, B. Chen, Y. Pan, H.S. Zhao, L. Ye, Joining of C<sub>f</sub>/SiC composite with a Cu–Au–Pd–V brazing filler and interfacial reactions, *J. Eur. Ceram. Soc.* 34 (2014) 1481–1486. <https://doi.org/10.1016/j.jeurceramsoc.2013.12.022>.
23. H.P. Xiong, B. Chen, Y. Pan, W. Mao, Y.Y. Cheng, Interfacial reactions and joining characteristics of a Cu–Pd–V system filler alloy with C<sub>f</sub>/SiC composite, *Ceram. Int.* 40 (2014) 7857–7863. <https://doi.org/10.1016/j.ceramint.2013.12.131>.
24. H.P. Xiong, B. Chen, Y. Pan, W. Mao, Y.Y. Cheng, Interfacial reactions and joining characteristics of a Cu–Pd–V system filler alloy with C<sub>f</sub>/SiC composite, *Ceram. Int.* 40 (2014) 7857–7863. <https://doi.org/10.1016/j.ceramint.2013.12.131>.
25. H.P. Xiong, W. Mao, Y.H. Xie, B. Chen, W.L. Guo, X.H. Li, Y.Y. Cheng, Control of interfacial reactions and strength of the SiC/SiC joints brazed with newly-developed Co-based brazing alloy, *J. Mater. Res.* 22 (2007) 2727–2736. <https://doi.org/10.1557/JMR.2007.0370>.
26. H.X. Li, Z.H. Zhong, H.B. Zhang, Z.X. Zhu, P. Hua, C. Chen, Y.C. Wu, Microstructure characteristic and its influence on the strength of SiC ceramic joints diffusion bonded by spark plasma sintering, *Ceram. Int.* 44 (2018) 3937–3946. <https://doi.org/10.1016/j.ceramint.2017.11.185>.
27. H.Y. Dong, Y.D. Yu, X.L. Jin, X. Tian, W. He, W. Ma, Microstructure and mechanical properties of SiC–SiC joints joined by spark plasma sintering, *Ceram. Int.* 42 (2016) 14463–14468. <http://dx.doi.org/10.1016/j.ceramint.2016.06.049>.
28. J. Ba, X. Ji, B. Wang, P. Li, J. Lin, J. Qi, J. Cao, Root-like C/SiC surface structure fabricated by the thermal and electrochemical corrosion for brazing to Nb, *Compos. B: Eng.* 218 (2021) 108942. <https://doi.org/10.1016/j.compositesb.2021.108942>.
29. J. Li, G. Zhu, P. Xiao, Joining reaction-bonded silicon carbide using Inconel 600 superalloy, *J. Mater. Sci. Lett.* 22 (2003) 759–761. <https://doi.org/10.1023/A:1023768414427>.
30. J. Lis, Y. Miyamoto, R. Pampuch, K. Tanihata, Ti<sub>3</sub>SiC-based materials prepared by HIP-SHS techniques, *Mater Lett.* 22 (1995) 163–168. [https://doi.org/10.1016/0167-577X\(94\)00246-0](https://doi.org/10.1016/0167-577X(94)00246-0).
31. J. Zheng, M. Akinc, Green state joining of SiC without applied pressure, *J. Am. Ceram. Soc.* 84 (2001) 2479–2483. <https://doi.org/10.1111/j.1151-2916.2001.tb01039.x>.
32. J.J. Zhang, S.J. Li, H.P. Duan, Y. Zhang, Joining of C/ SiC to Ni-based superalloy with Zr/Ta composite interlayers by hot-pressing diffusion welding, *Rare Metal Mat. Eng.* 31 (2002) 393–396.

33. J.T. Xiong, J.L. Li, F.S. Zhang, W. Huang, Joining of 3D C/SiC composites to niobium alloy, *Scr. Mater.* 55 (2006) 151–154. <https://doi.org/10.1016/j.scriptamat.2006.03.050>.
34. J.T. Xiong, J.L. Li, F.S. Zhang, W.D. Huang, Joining of 2D C/SiC composites with niobium alloy, *Inorg. Mater.* 21 (2006) 1391–1396.
35. K. Zhang, L. Zhang, R. He, K. Wang, K. Wei, B. Zhang, Joining of Cf/SiC Ceramic Matrix Composites: A Review, *Adv. Mater. Sci. Eng.* (2018), Article ID 6176054. <https://doi.org/10.1155/2018/6176054>.
36. M. Patel, V. Singh, S. Singh, V.V.B. Prasad, Micro-structural evolution during diffusion bonding of C-SiC/C-SiC composite using Ti interlayer, *Mater. Charact.* 135 (2018) 71–75. <https://doi.org/10.1016/j.matchar.2017.11.031>.
37. M. Radovic, M.W. Barsoum, T. El-Raghy, J. Seidensticker, S. Wiederhorn, Tensile properties of  $Ti_3SiC_2$  in the 25–1300°C temperature range, *Acta Mater.* 48 (2000) 453–459. [https://doi.org/10.1016/S1359-6454\(99\)00351-1](https://doi.org/10.1016/S1359-6454(99)00351-1).
38. M. Salvo, M. Ferraris, P. Lemoine, M.M. Appendino, M. Merola, Joining of CMCs for thermonuclear fusion applications, *J. Nucl. Mater.* 233–237 (1996) 949–953. [https://doi.org/10.1016/S0022-3115\(96\)00148-1](https://doi.org/10.1016/S0022-3115(96)00148-1).
39. M.W. Barsoum MW. The  $M_{N+1}AX_N$  phases: A new class of solids: Thermodynamically stable nanolaminates. *Prog. Solid State Chem.* 28 (2000) 201–281. [https://doi.org/10.1016/S0079-6786\(00\)00006-6](https://doi.org/10.1016/S0079-6786(00)00006-6).
40. P. Colombo, V. Sglavo, E. Pippel, J. Wolterdorf, Joining of reaction-bonded silicon carbide using a preceramic polymer. *J. Mater. Sci.* 33 (1998) 2405–2412. <https://doi.org/10.1023/A:1004312109836>.
41. P. Greil, Active-filler-controlled pyrolysis of preceramic polymers. *J. Am. Ceram. Soc.* 78 (1995) 835–848. <https://doi.org/10.1111/j.1151-2916.1995.tb08404.x>.
42. P. Tatarko, V. Casalegno, C. Hu C, M. Salvo, M. Ferraris, M.J. Reece, Joining of CVD-SiC coated and uncoated fibre reinforced ceramic matrix composites with pre-sintered  $Ti_3SiC_2$  MAX phase using Spark Plasma Sintering, *J Eur Ceram Soc.* 36 (2016) 3957–3967. <https://doi.org/10.1016/j.jeurceramsoc.2016.06.025>.
43. P. Tatarko, Z. Chlup, A. Mahajan, V. Casalegno, T.G. Saunders, I. Dlouhy, M.J. Reece, High-temperature properties of the monolithic CVD  $\beta$ -SiC materials joined with a pre-sintered MAX phase  $Ti_3SiC_2$  interlayer via solid-state diffusion bonding, *J. Eur. Ceram. Soc.* 37 (2017) 1205–1216. <https://doi.org/10.1016/j.jeurceramsoc.2016.11.006>.

44. P.K. Gianchandani, V. Casalegno, F. Smeacetto, M. Ferraris, Pressure-less joining of C/SiC and SiC/SiC by a MoSi<sub>2</sub>/Si composite. *Int. J. Appl. Ceram. Technol.* 14 (2017) 305–312. <https://doi.org/10.1111/ijac.12631>.
45. Q. Zhang, L.B. Sun, Q.Y. Liu, G. Wang, Y. Xuan, Effect of brazing parameters on microstructure and mechanical properties of C<sub>f</sub>/SiC and Nb-1Zr joints brazed with Ti-Co-Nb filler alloy, *J. Eur. Ceram. Soc.* 37 (2017) 931–937. <https://doi.org/10.1016/j.jeurceramsoc.2016.09.031>.
46. Q.Y. Tong, L.F. Cheng, L.T. Zhang, Liquid infiltration joining of 2D C/SiC composite, *Sci. Eng. Compos.* 13 (2006) 31–36.
47. Q.Y. Tong, L.F. Cheng, L.T. Zhang, Microstructure and properties of joints of 2D C/SiC composites, *Mater. Eng.* 11 (2002) 14–16.
48. Q.Y. Tong, L.F. Cheng, L.T. Zhang, On-line joining of 3D fiber reinforced C/SiC composites, *Rare Metal Mat. Eng.* 33 (2004) 101–104., 2004.
49. R. Aroshas, I. Rosenthal, A. Stern, Z. Shmul, S. Kalabhukhov, N. Frage, Silicon carbide diffusion bonding by spark plasma sintering. *Mater. Manuf. Process.* 30 (2015) 122–126. <https://doi.org/10.1080/10426914.2014.952019>.
50. R. Asthana, M. Singh, Joining of partially sintered alumina to alumina, titanium, Hastelloy and C–SiC composite using Ag–Cu brazes, *J. Eur. Ceram. Soc.* 28 (2008) 617–631. <https://doi.org/10.1016/j.jeurceramsoc.2007.06.017>.
51. R. Rosa, P. Veronesi, S. Han, V. Casalegno, M. Salvo, E. Colombini, C. Leonelli, M. Ferraris, Microwave assisted combustion synthesis in the system Ti–Si–C for the joining of SiC: Experimental and numerical simulation results, *J. Eur. Ceram. Soc.* 33 (2013) 1707–1719. <https://doi.org/10.1016/j.jeurceramsoc.2013.03.005>.
52. S. Gao, Y. Zhou, C.F. Li, Z.Q. Liu, T. Jin, Effects of platinum group metals addition on the precipitation of topologically close-packed phase in Ni-base single crystal superalloys, *J Alloys Compd.* 671 (2016) 458–464. <https://doi.org/10.1016/j.jallcom.2016.02.122>.
53. S. Grasso, P. Tatarko, S. Rizzo, H. Porwal, C. Hu, Y. Katoh, M. Salvo, M.J. Reece, M. Ferraris, Joining of  $\beta$ -SiC by spark plasma sintering, *J. Eur. Ceram. Soc.* 34 (2014) 1681–1686. <http://dx.doi.org/10.1016/j.jeurceramsoc.2013.12.023>.
54. S. Hausner, B. Wielage, *Brazing of metal and ceramic joints*, Advances in Brazing, Woodhead Publishing, UK, 2013. <https://doi.org/10.1533/9780857096500.2.361>.
55. S. Rizzo, S. Grasso, M. Salvo, V. Casalegno, M.J. Reece, M. Ferraris, Joining of C/SiC composites by spark plasma sintering technique, *J. Eur. Ceram. Soc.* 34 (2014) 903–913. <https://doi.org/10.1016/j.jeurceramsoc.2013.10.028>.

56. S.D. Peteves, M. Paulasto, G. Ceccone, V. Stamos, The reactive route to ceramic joining: fabrication, interfacial chemistry and joint properties, *Acta Mater.* 46 (1998) 2407-2414. [https://doi.org/10.1016/S1359-6454\(98\)80023-2](https://doi.org/10.1016/S1359-6454(98)80023-2).
57. T. El-Raghy, M.W. Barsoum, A. Zavaliangos, S.R. Kalidindi, Processing and mechanical properties of  $Ti_3SiC_2$ : II, Effect of Grain Size and Deformation Temperature. *J Am Ceram Soc.* 82 (1999) 2855-2860. <https://doi.org/10.1111/j.1151-2916.1999.tb02167.x>.
58. T. Fukai, M. Naka, J.C. Schuster, Interfacial Structure and Reaction Mechanism of SiC/V Joints (Materials, Metallurgy & Weldability). *Trans JWRI.* 26 (1997) 93-98.
59. W. Li, H. Feng, B. Chen, H. Xiong, Y. Cheng, Joining of  $C_f/SiC$  composite with Cu-Pd-V filler alloy and Mo interlayer, *Weld World.* 65 (2021) 713-719. <https://doi.org/10.1007/s40194-020-01033-8>.
60. W. Wang, Y. Wang, J. Huang, Z. Ye, J. Yang, S. Chen, X. Zhao, *J. Mater. Process. Technol.* 300 (2022) 117419. <https://doi.org/10.1016/j.jmatprotec.2021.117419>.
61. W.B. Tian, H. Kita, H. Hyuga, N. Kondo, Joining of SiC by Al infiltrated TiC tape: Effect of joining parameters on the microstructure and mechanical properties, *J. Eur. Ceram. Soc.* 32 (2012) 149–156. <http://dx.doi.org/10.1016/j.jeurceramsoc.2011.08.001>.
62. W.B. Tian, H. Kita, H. Hyuga, N. Kondo, T. Nagaoka, Reaction joining of SiC ceramics using  $TiB_2$ -based composites, *J. Eur. Ceram. Soc.* 30 (2010) 3203–3208. <http://dx.doi.org/10.1016/j.jeurceramsoc.2010.07.017>.
63. W.B. Tian, H. Kita, N. Kondo, H. Hyuga, T. Nagaoka, Effect of composition and joining parameters on microstructure and mechanical properties of silicon carbide joints, *J. Ceram. Soc. Jpn.* 118 (2010) 799–804. <https://doi.org/10.2109/jcersj2.118.799>
64. W.B. Tian, Z.M. Sun, P. Zhang, Y.M. Zhang, J. Shi, Brazing of silicon carbide ceramics with Ni-Si-Ti powder mixtures, *J. Aust. Ceram. Soc.* 53 (2017) 511–516. <https://doi.org/10.1007/s41779-017-0061-7>.
65. W.W. Li, B. Chen, H.P. Xiong, W.J. Zou, H.S. Ren, Reactive brazing  $C_f/SiC$  to itself and to Mo using the NiPdPtAu-Cr filler alloy, *J. Eur. Ceram. Soc.* 37 (2017) 3849-3859. <https://doi.org/10.1016/j.jeurceramsoc.2017.05.025>.
66. X. Hernandez, C. Jiménez, K. Mergia, P. Yialouris, S. Messoloras, V. Liedtke, C. Wilhelmi, J. Barcena, An Innovative Joint Structure for Brazing  $C_f/SiC$  Composite to Titanium Alloy, *J. Mater. Eng. Perform.* 23 (2014) 3069–3076. <https://doi.org/10.1007/s11665-014-1074-9>.

67. X. Tian, J. Feng, J. Shi, Y. Liu, L. Zhang, Interfacial microstructure and mechanical properties of the vacuum brazed C/SiC composite and Nb joints, *Vacuum* 146 (2017) 97–105. <https://doi.org/10.1016/j.vacuum.2017.09.039>.
68. X. Tong, T. Okano, T. Iseki, T. Yano, Synthesis and high temperature mechanical properties of  $\text{Ti}_3\text{SiC}_2/\text{SiC}$  composite, *J Mater Sci.* 30 (1995) 3087–3090. <https://doi.org/10.1007/BF01209221>.
69. X. Wang, J. Wang, H. Wang, Joining of SiC ceramics via a novel liquid preceramic polymer (V-PMS). *Ceram. Int.* 41 (2015) 7283–7288. <https://doi.org/10.1016/j.ceramint.2015.02.008>.
70. X. Zhao, L. Duan, W. Liu, Y. Wang, Fast-diffusion joining of SiC-coated three-dimensional C/SiC composites with a Mo-W-Mo interlayer by spark plasma sintering. *Ceram. Int.* 45 (2019) 23111–23118. <https://doi.org/10.1016/j.ceramint.2019.08.005>.
71. X. Zhao, L. Duan, Y. Wang, Improved shear strength of SiC-coated 3D C/SiC composite joints with a tailored Ti-Si-C interlayer, *J. Eur. Ceram. Soc.* 39 (2019) 788–797. <https://doi.org/10.1016/j.jeurceramsoc.2018.11.016>.
72. X.B. Zhou, Y.H. Han, X.F. Shen, S. Du, J. Lee, Q. Huang, Fast joining SiC ceramics with  $\text{Ti}_3\text{SiC}_2$  tape film by electric field-assisted sintering technology, *J. Nucl. Mater.* 466 (2015) 322–327. <http://dx.doi.org/10.1016/j.jnucmat.2015.08.004>.
73. X.G. Chen, J.C. Yan, S.C. Ren, Q. Wang, J. Wei, G. Gan, Microstructure, mechanical properties, and bonding mechanism of ultrasonic-assisted brazed joints of SiC ceramics with ZnAlMg filler metals in air, *Ceram. Int.* 40 (2014) 683–689. <http://dx.doi.org/10.1016/j.ceramint.2013.06.055>.
74. X.G. Chen, R.S. Xie, Z.W. Lai, L. Liu, J. Yan, G. Zou, Interfacial structure and formation mechanism of the ultrasonic-assisted brazed joint of SiC ceramics with Al–12Si filler metals in air, *J. Mater. Sci. Technol.* 33 (2017) 492–498. <http://dx.doi.org/10.1016/j.jmst.2016.03.016>.
75. X.H. Li, Z.Q. Wang, Z.H. Zhong, Q. Wen, K.J. Song, H.B. Zhang, Y.C. Wu, Microalloying effects of yttrium on the microstructure and strength of silicon carbide joint brazed with chromium–silicon eutectic alloy, *J. Alloys Compd.* 738 (2018) 354–362. <https://doi.org/10.1016/j.jallcom.2017.12.137>.
76. X.K. Yuan, S. Chen, X.H. Zhang, T. Jin, Joining SiC ceramics with silicon resin YR3184. *Ceram. Int.* 35 (2009) 3241–3245. <https://doi.org/10.1016/j.ceramint.2009.05.025>.
77. X.Y. Dai, J. Cao, Y.T. Tian, Z. Chen, X. Song, J. Feng, Effect of holding time on microstructure and mechanical properties of SiC/SiC joints brazed by Ag–Cu–Ti+B4C

- composite filler, *Mater. Charact.* 118 (2016) 294–301. <http://dx.doi.org/10.1016/j.matchar.2016.06.008>.
78. X.Y. Dai, J. Cao, Z. Chen, X. Song, J. Feng, Brazing SiC ceramic using novel B<sub>4</sub>C reinforced Ag–Cu–Ti composite filler, *Ceram. Int.* 42 (2016) 6319–6328. <http://dx.doi.org/10.1016/j.ceramint.2016.01.021>.
79. X.Z. Wang, J. Wang, H. Wang, Synthesis of a novel preceramic polymer (V-PMS) and its performance in heat-resistant organic adhesives for joining SiC ceramic. *J. Eur. Ceram. Soc.* 32 (2012) 3415–3422. <http://dx.doi.org/10.1016/j.jeurceramsoc.2012.03.032>.
80. Y. Du, C.Y. Liang, X. Zheng, Joining of Cf/SiC composites with Niobium alloy, *Aerosp. Mater. Technol.* 39 (2009) 45–48.
81. Y. Katoh, L.L. Snead, T. Cheng, C. Shih, W.D. Lewis, T. Koyanagi, T. Hinoki, C.H. Henager Jr., M. Ferraris, Radiation-tolerant joining technologies for silicon carbide ceramics and composites, *J. Nucl. Mater.* 448 (2014) 497–511. <http://dx.doi.org/10.1016/j.jnucmat.2013.10.002>.
82. Y. Liu Y, Y.Z. Zhu, Y. Yang, X. Liu, Z. Huang, Microstructure of reaction layer and its effect on the joining strength of SiC/SiC joints brazed using Ag–Cu–In–Ti alloy, *J. Adv. Ceram.* 3 (2014) 71–75. <https://doi.org/10.1007/s40145-014-0095-z>.
83. Y. Liu, Q. Qi, Y.Z. Zhu, Z. Zhang, Microstructure and joining strength evaluation of SiC/SiC joints brazed with SiC<sub>p</sub>/Ag–Cu–Ti hybrid tapes, *J. Adhes. Sci. Technol.* 29 (2015) 1563–1571. <http://dx.doi.org/10.1080/01694243.2015.1034925>.
84. Y. Liu, Z.R. Huang, X.J. Liu, Joining of sintered silicon carbide using ternary Ti–Cu–Ag active brazing alloy, *Ceram. Int.* 35 (2009) 3479–3484. [10.1016/j.ceramint.2009.03.016](http://dx.doi.org/10.1016/j.ceramint.2009.03.016).
85. Y. Zhou, Z. Sun, Micro-scale plastic deformation of polycrystalline Ti<sub>3</sub>SiC<sub>2</sub> under room-temperature compression, *J. Eur. Ceram. Soc.* 21 (2001) 1007–1011. [https://doi.org/10.1016/S0955-2219\(00\)00310-1](https://doi.org/10.1016/S0955-2219(00)00310-1).
86. Y. Zhou, Z. Sun, Temperature fluctuation/hot pressing synthesis of Ti<sub>3</sub>SiC<sub>2</sub>. *J. Mater. Sci.* 35 (2000) 4343–4346. <https://doi.org/10.1023/A:1004848705481>.
87. Y.I. Jung, J.H. Park, H.G. Kim, D.J. Park, J.Y. Park, W.J. Kim, Effect of Ti and Si interlayer materials on the joining of SiC ceramics, *Nucl. Eng. Technol.* 48 (2016) 1009–1014. <http://dx.doi.org/10.1016/j.net.2016.03.001>.
88. Y.M. He, J. Zhang, X. Wang, Y. Sun, Effect of brazing temperature on microstructure and mechanical properties of Si<sub>3</sub>N<sub>4</sub>/Si<sub>3</sub>N<sub>4</sub> joints brazed with Ti–Cu–Ag+Mo composite filler, *J. Mater. Sci.* 46 (2011) 2796–2804. <https://doi.org/10.1007/s10853-010-5154-4>.

89. Y.Z. Liu, L.X. Zhang, C.B. Liu, Z.W. Yang, H.W. Li, J.C. Feng, Brazing C/SiC composites and Nb with TiNiNb active filler metal, *Sci. Technol. Weld. Join.* 16 (2011) 193-198. <https://doi.org/10.1179/1362171810Y.0000000021>.
90. Z.P. Wang, J.H. Huang, H. Zhang, X. K. Zhao, Reactive composite brazing of C/SiC composites to Ti alloy with (Ag-6Al)+Ti+C composite filler materials, *Mater. Sci. Technol.* 27 (2011) 49-52. <https://doi.org/10.1179/174328409X418955>.
91. Z.W. Yang, L. X. Zhang, X. Y. Tian, Y. Liu, P. He, J. Feng, Interfacial microstructure and mechanical properties of TiAl and Cf/SiC joint brazed with TiH<sub>2</sub>-Ni-B brazing powder, *Mater. Charact.* 79 (2013) 52–59. <https://doi.org/10.1016/j.matchar.2013.02.010>.
92. Z.W. Yang, P. He, J.C.Feng, Microstructural evolution and mechanical properties of the joint of TiAl alloys and C/ SiC composites vacuum brazed with Ag-Cu filler metal, *Mater. Charact.* 62 (2011) 825–832. <https://doi.org/10.1016/j.matchar.2011.05.007>.

**References:**

- (1) A. Bellosi, T. Kosmac, A.P. Tomsia, *Interfacial Science in Ceramic Joining*, Series: Nato Science Partnership Subseries: 3, vol. 58 (Springer, Berlin, 1998)
- (2) B. Hohmann, Mechanical behavior of dip-brazed aluminium sandwich panels, *Corpus ID: 108851035* (2007).
- (3) G. Liu, X. Zhang, J. Yang, G. Qiao, Recent advances in joining of SiC-based materials (monolithic SiC and SiCf/SiC composites): Joining processes, joint strength, and interfacial behaviour, *J. Adv. Ceram.* 8 (2019) 19-38. <https://doi.org/10.1007/s40145-018-0297-x>.
- (4) J.A. Fernie, R.A.L. Drew, K.M. Knowles, Joining of engineering ceramics, *Int. Mater. Rev.* 54 (2009) 283–331. <https://doi.org/10.1179/174328009X461078>
- (5) L.O. Siqueira, A.C. Santos da Silva, I.J. Marques, C.H. Gonzalez, T.F.A. Santos, Microstructural Evaluation of Copper Brazed Joints Using Silver-Based Filler Metal, *Metallogr. Microstruct. Anal.* 10 (2021) 174–183. <https://doi.org/10.1007/s13632-021-00722-0>.
- (6) M. Ferraris, A. Ventrella, M. Salvo, D. Gross, Shear strength measurement of AV119 epoxy-joined SiC by different torsion tests, *Int. J. Appl. Ceram. Technol.* 11(2014) 394–401. <https://doi.org/10.1111/ijac.12025>.
- (7) M. Ferraris, M. Salvo, V. Casalegno, M. Avalle, A. Ventrella, Torsion tests on AV119 epoxy-joined SiC, *Int. J. Appl. Ceram. Technol.* 9 (2012) 795–807. <https://doi.org/10.1111/j.1744-7402.2011.02740.x>.
- (8) M. Schwartz, *Brazing*, 2<sup>nd</sup> ed. (ASM International, USA, 2003).
- (9) M.B. Uday, M.N.A. Fauzi, H. Zuhailawati, A.B. Ismail, Effect of welding speed on mechanical strength of friction welded joint of YSZ–alumina composite and 6061 aluminium alloy, *Mater. Sci. Eng. A* 528 (2011) 4753. <https://doi.org/10.1016/j.msea.2011.02.091>.
- (10) R.J. Lemus, *Diffusion Bonding of Silicon Nitride to Titanium* (Ph.D. thesis, McGill University, Montréal, Canada, 2000)
- (11) R.M. Trimmer and A.T. Kuhn, The Strength of Silver-Brazed Stainless Steel Joints—A Review, *Brazing Soldering* 2 (1982) 6–13.
- (12) RE Loehman, Recent Progress in Ceramic Joining, Sandia National Laboratory Report, SAND-98-1341C (1998).

- (13) S. Mishra, A. Sharma, D.H. Jung, J.P. Jung, Recent advances in active metal brazing of ceramics and process, *Met. Mater. Int.* 26 (2020) 1087–1098. <https://doi.org/10.1007/s12540-019-00536-4>.
- (14) V.V Rao, V. Ravindra, Vacuum furnaces for metallurgical processing, *J. Metall. Mater. Sci.* 62 (2020) 123-129.
- (15) Y. Chen, H. Cui, Effect of Temperature and Hold Time of Induction Brazing on Microstructure and Shear Strength of Martensitic Stainless Steel Joints, *Materials* 11 (2018) 1586. <https://doi.org/10.3390/ma11091586>.
- (16) Y. Katoh, L.L. Snead, T. Cheng, C. Shih, W.D. Lewis, T. Koyanagi, T. Hinoki, C.H. Henager Jr., M. Ferraris, Radiation-tolerant joining technologies for silicon carbide ceramics and composites, *J. Nucl. Mater.* 448 (2014) 497–511. <https://doi.org/10.1016/j.jnucmat.2013.10.002>.
- (17) Y. Zhou, *Microjoining and Nanojoining*, 1st ed. (Elsevier, Amsterdam, 2008).

**References:**

- (1) A. Bartlett, A.G. Evans, M. Rühle, Residual stress cracking of metal/ceramic bonds, *Acta Metall. Mater.* 39 (1991) 1579–1585, [https://doi.org/10.1016/0956-7151\(91\)90245-V](https://doi.org/10.1016/0956-7151(91)90245-V).
- (2) A. Kawecki, T. Knych, E. Sieja-smaga, A. Mamala, P. Kwasniewski, G. Kiesiewicz, B. Smyrak, A. Pacewicz, Fabrication, properties and microstructures of high strength and high conductivity copper-silver wires, *Arch. Metall. Mater.* 57 (2012) 1261–1270, <https://doi.org/10.2478/v10172-012-0141-1>.
- (3) A.I. Khuri, S. Mukhopadhyay, Response surface methodology, *Comput. Stat.* 2 (2010) 128–149, <https://doi.org/10.1002/wics.73>.
- (4) B. Cui, J. Huang, C. Cai, S. Chen, X. Zhao, Microstructures and mechanical properties of Cf/SiC composite and TC4 alloy joints brazed with (Ti-Zr-Cu-Ni)+W composite filler materials, *Compos. Sci. Technol.* 97 (2014) 19–26, <https://doi.org/10.1016/j.compscitech.2014.03.021>.
- (5) C. Liu, J. Chen, H. Han, Y. Wang, Z. Zhang, A long duration and high-reliability liquid apogee engine for satellites, *Acta Astronaut.* 55 (2004) 401–408, <https://doi.org/10.1016/j.actaastro.2004.05.030>.
- (6) D. Fan, J. Huang, X. Zhao, J. Yang, S. Chen, X. Zhao, Joining of C<sub>f</sub>/SiC composite to Ti-6Al-4V with (Ti-Zr-Cu-Ni)+Ti filler based on in-situ alloying concept, *Ceram. Int.* 43 (2017) 4151–4158, <https://doi.org/10.1016/j.ceramint.2016.12.030>.
- (7) D. Liu, H. Niu, J. Liu, X. Song, L. Xia, J. Feng, Effect of processing parameters on the formation of C<sub>f</sub>/LAS composites/Ag-Cu-Ti/TC4 brazed joint, *Mater. Char.* 120 (2016) 249–256, <https://doi.org/10.1016/j.matchar.2016.09.014>.
- (8) D. Sciti, A. Bellosi, L. Esposito, Bonding of zirconia to superalloy with the active brazing technique, *J. Eur. Ceram. Soc.* 21 (2001) 45–52, [https://doi.org/10.1016/S0955-2219\(00\)00162-X](https://doi.org/10.1016/S0955-2219(00)00162-X).
- (9) D.Y. Fan, J.H. Huang, Y.H. Wang, S.H. Chen, X.K. Zhao, Active brazing of carbon fibre reinforced SiC composite and 304 stainless steel with Ti-Zr-Be, *Mater. Sci. Eng., A* 617 (2014) 66–72, <https://doi.org/10.1016/j.msea.2014.08.053>.
- (10) F.S. Ong, H. Tobe, G. Fujii, E. Sato, Microstructural evolution and mechanical characterisation of Nb-interlayer-inserted Ti-6Al-4V/Si<sub>3</sub>N<sub>4</sub> joints brazed with AuNiTi filler, *Mater. Sci. Eng., A* 778 (2020), 139093, <https://doi.org/10.1016/j.msea.2020.139093>.

- (11) G. Lin, J. Huang, H. Zhang, Joints of carbon fibre-reinforced SiC composites to Ti- alloy brazed by Ag–Cu–Ti short carbon fibre, *J. Mater. Process. Technol.* 189 (2007) 256–261, <https://doi.org/10.1016/j.jmatprotec.2007.01.031>.
- (12) G.N. Yushin, E.N. Hoffman, A. Nikitin, H. Ye, M.W. Barsoum, Y. Gogotsi, Synthesis of nanoporous carbide-derived carbon by chlorination of titanium silicon carbide, *Carbon* 43 (2005) 2075–2082, <https://doi.org/10.1016/j.carbon.2005.03.014>.
- (13) H. Yang, X. Zhou, W. Shi, J. Wang, P. Li, F. Chen, Q. Deng, J. Lee, Y.H. Han, F. Huang, L. He, S. Du, Q. Huang, Thickness-dependent phase evolution and bonding strength of SiC ceramics joints with active Ti interlayer, *J. Eur. Ceram. Soc.* 37 (2017) 1233–1241, <https://doi.org/10.1016/j.jeurceramsoc.2016.12.009>.
- (14) J. Ba, X. Ji, B. Wang, P. Li, J. Lin, J. Qi, J. Cao, Root-like C/SiC surface structure fabricated by the thermal and electrochemical corrosion for brazing to Nb, *Compos. B Eng.* 218 (2021), 108942, <https://doi.org/10.1016/j.compositesb.2021.108942>.
- (15) J. Ba, X.H. Zheng, R. Ning, J.H. Lin, J.L. Qi, J. Cao, W. Cai, J.C. Feng, C/SiC composite-Ti6Al4V joints brazed with negative thermal expansion  $ZrP_2WO_{12}$  nanoparticle reinforced AgCu alloy, *J. Eur. Ceram. Soc.* 39 (2019) 755–761, <https://doi.org/10.1016/j.jeurceramsoc.2018.12.028>.
- (16) J. Xiong, J. Li, F. Zhang, W. Huang, Joining of 3D C/SiC composites to niobium alloy, *Scripta Mater.* 55 (2006a) 151–154, <https://doi.org/10.1016/j.scriptamat.2006.03.050>.
- (17) J.M. Shi, L.X. Zhang, X.Y. Pan, X.Y. Tian, J.C. Feng, Microstructure evolution and mechanical property of ZrC-SiC/Ti6Al4V joints brazed using Ti-15Cu-15Ni filler, *J. Eur. Ceram. Soc.* 38 (2018) 1237–1245, <https://doi.org/10.1016/j.jeurceramsoc.2017.11.045>.
- (18) J.T. Xiong, J.L. Li, F.S. Zhang, W.D. Huang, Joining of 2D C/SiC composites with niobium alloy, *Inorg. Mater.* 21 (2006b) 1391–1396.
- (19) K. Jian, Z.H. Chen, Q.S. Ma, H.F. Hu, W.W. Zheng, Processing and properties of 2D- $C_f$ /SiC composites incorporating SiC fillers, *Mater. Sci. Eng., A* 408 (2005) 330–335, <https://doi.org/10.1016/j.msea.2005.08.205>.
- (20) K. Zhang, L. Zhang, R. He, K. Wang, K. Wei, B. Zhang, Joining of  $C_f$ /SiC ceramic matrix composites: a review, *Adv. Mater. Sci. Eng.* (2018), 6176054, <https://doi.org/10.1155/2018/6176054>.
- (21) K.K. Chawla, Ceramic matrix materials, in: K.K. Chawla (Ed.), *Ceramic Matrix Composites*, second ed., Springer US, Boston, 2003, pp. 11–46, [https://doi.org/10.1007/978-1-4615-1029-1\\_2](https://doi.org/10.1007/978-1-4615-1029-1_2).

- (22) M. Singh, R. Asthana, Characterisation and control of interfaces for high-quality advanced materials-II, *Ceram. Trans.* 198 (2007) 9–14.
- (23) M. Singh, R. Asthana, T.P. Shpargel, Brazing of ceramic-matrix composites to Ti and Hastelloy using Ni-base metallic glass interlayers, *Mater. Sci. Eng., A* 498 (2008) 19–30, <https://doi.org/10.1016/j.msea.2007.11.150>.
- (24) M. Singh, T. Matsunaga, H. Lin, R. Asthana, T. Ishikawa, Microstructure and mechanical properties of joints in sintered SiC fibre-bonded ceramics brazed with Ag-Cu-Ti alloy, *Mater. Sci. Eng., A* 557 (2012) 69–76, <https://doi.org/10.1016/j.msea.2012.05.110>.
- (25) M.C. Halbig, R. Asthana, M. Singh, Diffusion bonding of SiC fibre-bonded ceramics using Ti/Mo and Ti/Cu interlayers, *Ceram. Int.* 41 (2015) 2140–2149, <https://doi.org/10.1016/j.ceramint.2014.10.014>.
- (26) M.C.L. Patterson, S. He, L.L. Fehrenbacher, J. Hanigofsky, B.D. Reed, Advanced HfC-TaC oxidation resistant composite rocket thruster, *Mater. Manuf. Process.* 11 (1996) 367–379, <https://doi.org/10.1080/10426919608947492>.
- (27) N.A. Fleck, J.W. Hutchinson, Z. Suo, Crack path selection in a brittle adhesive layer, *Int. J. Solid Struct.* 27 (1991) 1683–1703, [https://doi.org/10.1016/0020-7683\(91\)90069-R](https://doi.org/10.1016/0020-7683(91)90069-R).
- (28) P. Lia, Y. Yan, J. Ba, B. Liu, J. Lin, J. Cao, J. Qi, Design CuZr alloy to control Ti diffusion and reaction layer thickness in C/C-TC4 joints *Mater. Char.* 188 (2022), 111889, <https://doi.org/10.1016/j.matchar.2022.111889>.
- (29) P. Wang, J. Lin, Z. Xu, B. Qin, J. Cao, J. Feng, J. Qi, Negative thermal expansion of  $\text{Sc}_2\text{W}_3\text{O}_{12}$  interlayer with three-dimensional interpenetrating network structure for brazing C/SiC composites and GH3536, *Carbon* 201 (2023) 765–775, <https://doi.org/10.1016/j.carbon.2022.09.072>.
- (30) P. Wang, X. Liu, H. Wang, J. Cao, J. Qi, J. Feng, Negative thermal expansion  $\text{Y}_2\text{Mo}_3\text{O}_{12}$  particles reinforced AgCuTi composite filler for brazing C/SiC and GH3536, *Mater. Char.* 185 (2022), 111754, <https://doi.org/10.1016/j.matchar.2022.111754>.
- (31) P.D. Awasthi, P. Agrawal, R.S. Haridas, R.S. Mishra, M.T. Stawovy, S. Ohm, A. Imandoust, Mechanical properties and microstructural characteristics of additively manufactured C103 niobium alloy, *Mater. Sci. Eng., A* 831 (2022), 142183, <https://doi.org/10.1016/j.msea.2021.142183>.
- (32) P.R. Subramanian, D.E. Laughlin, Phase diagrams of binary copper alloys, Monograph series on alloy phase diagrams 10 (1994) 109.
- (33) Q. Zhang, L. Sun, Q. Liu, J. Zhang, T. Wang, C. Liu, Effect of brazing parameters on microstructure and mechanical properties of C/SiC and Nb-1Zr joints brazed with Ti-

- Co-Nb filler alloy, *J. Eur. Ceram. Soc.* 37 (2017) 931–937, <https://doi.org/10.1016/j.jeurceramsoc.2016.09.031>.
- (34) R.H. Myers, D.C. Montgomery, G.G. Vining, C.M. Borrer, S.M. Kowalski, Response surface methodology: a retrospective and literature survey, *J. Qual. Technol.* 36 (2004) 53–77, <https://doi.org/10.1080/00224065.2004.11980252>.
- (35) S. Kumar, A. Painuly, A. Kamal, S. Kuttappan, R.R. Kumar, P.P. Shyin, R. Devasia, Development of C/SiC fasteners for high-temperature applications, *Mater. Perform. Charact.* 10 (2021) 253–267, <https://doi.org/10.1520/MPC20200161>.
- (36) S. Schmidt, S. Beyer, H. Knabe, H. Immich, R. Meistring, A. Gessler, Advanced ceramic matrix composite materials for current and future propulsion technology applications, *Acta Astronaut.* 55 (2004) 409–420, <https://doi.org/10.1016/j.actaastro.2004.05.052>.
- (37) S.B. Lee, J.H. Kim, Finite-element analysis and X-ray measurement of the residual stresses of ceramic/metal joints, *J. Mater. Process. Technol.* 67 (1997) 167–172, [https://doi.org/10.1016/S0924-0136\(96\)02838-5](https://doi.org/10.1016/S0924-0136(96)02838-5).
- (38) W. Krenkel, Carbon fibre reinforced silicon carbide composites (C/SiC, C/C-SiC), in: N.P. Bansal (Ed.), *Handbook of Ceramic Composites*, Springer US, New York, 2005, pp. 117–148, [https://doi.org/10.1007/0-387-23986-3\\_6](https://doi.org/10.1007/0-387-23986-3_6).
- (39) W. Wang, Y. Wang, J. Huang, Z. Ye, J. Yang, S. Chen, X. Zhao, Reaction-composite diffusion brazing of C-SiC composite and Ni-based superalloy using mixed (Cu-Ti)+ C powder as an interlayer, *J. Mater. Process. Technol.* 300 (2022), 117419, <https://doi.org/10.1016/j.jmatprotec.2021.117419>.
- (40) X. Hernandez, C. Jiménez, K. Mergia, P. Yialouris, S. Messoloras, V. Liedtke, C. Wilhelmi, J. Barcena, An innovative joint structure for brazing Cf/SiC composite to titanium alloy, *Mater. Eng. Perform.* 23 (2014) 3069–3076, <https://doi.org/10.1007/s11665-014-1074-9>.
- (41) X. Tian, J. Feng, J. Shi, Y. Liu, L. Zhang, Interfacial microstructure and mechanical properties of the vacuum brazed C/SiC composite and Nb joints, *Vacuum* 146 (2017) 97–105, <https://doi.org/10.1016/j.vacuum.2017.09.039>.
- (42) X. Zhao, L. Duan, Y. Wang, Improved shear strength of SiC-coated 3D C/SiC composite joints with a tailored Ti-Si-C interlayer, *J. Eur. Ceram. Soc.* 39 (2019) 788–797, <https://doi.org/10.1016/j.jeurceramsoc.2018.11.016>.
- (43) Y. Du, C.Y. Liang, X. Zheng, Joining of Cf/SiC composites with Niobium alloy, *Aerosp. Mater. Technol.* 39 (2009) 45–48.

- (44) Y. Liu, Z.R. Huang, X.J. Liu, Joining of sintered silicon carbide using ternary Ag–Cu–Ti active brazing alloy, *Ceram. Int.* 35 (2009) 3479–3484, <https://doi.org/10.1016/j.ceramint.2009.03.016>.
- (45) Y. Wang, W. Wang, J. Huang, Z. Ye, J. Yang, S. Chen, Joining of Cf/SiC and stainless steel with (Cu-Ti)+C composite filler to obtain a stress-relieved and high-temperature resistant joint, *J. Mater. Res. Technol.* 12 (2021) 2026–2041, <https://doi.org/10.1016/j.jmrt.2021.04.009>.
- (46) Y.V. Naidich, V.S. Zhuravlev, I.I. Gab, B.D. Kostyuk, V.P. Krasovskyy, A. A. Adamovskyy, N.Y. Taranets, Liquid metal wettability and advanced ceramic brazing, *J. Eur. Ceram. Soc.* 28 (2008) 717–728, <https://doi.org/10.1016/j.jeurceramsoc.2007.07.021>.
- (47) Y.Z. Liu, L.X. Zhang, C.B. Liu, Z.W. Yang, H.W. Li, J.C. Feng, Brazing C/SiC composites and Nb with TiNiNb active filler metal, *Sci. Technol. Weld.* 16 (2011) 193–198, <https://doi.org/10.1179/1362171810Y.0000000021>.
- (48) Z. Wang, H.A. Butt, Q. Ma, Z. Wang, M. Li, Y. Lei, The use of a carbonised phenolic formaldehyde resin coated Ni foam as an interlayer to increase the high-temperature strength of C/C composite-Nb brazed joints, *Ceram. Int.* 48 (2022) 7584–7592, <https://doi.org/10.1016/j.ceramint.2021.11.302>.
- (49) Z. Yang, L.X. Zhang, X. Tian, Y. Liu, P. He, J. Feng, Interfacial microstructure and mechanical properties of TiAl and C/SiC joint brazed with TiH<sub>2</sub>–Ni–B brazing powder, *Mater. Char.* 79 (2013) 52–59, <https://doi.org/10.1016/j.matchar.2013.02.010>.
- (50) Z. Yang, P. He, L. Zhang, J. Feng, Microstructural evolution and mechanical properties of the joint of TiAl alloys and C/SiC composites vacuum brazed with Ag–Cu filler metal, *Mater. Char.* 62 (2011) 825–832, <https://doi.org/10.1016/j.matchar.2011.05.007>.
- (51) Z.S. Rak, A Process for Cf/SiC Composites using liquid polymer infiltration, *J. Am. Ceram. Soc.* 84 (2001) 2235–2239, <https://doi.org/10.1111/j.1151-2916.2001.tb00994.x>.

**References:**

- (1) B. Chen, H. Xiong, Y. Cheng, W. Mao, S. Wu, Microstructure and property of AlN joint brazed with Au-Pd-Co-Ni-V brazing filler, *J. Mater. Sci. Technol.* 31 (2015) 1034–1038, <https://doi.org/10.1016/j.jmst.2014.11.026>.
- (2) B. Harnisch, B. Kunkel, M. Deyerler, S. Bauereisen, U. Papenburg, Ultra-lightweight C/SiC Mirrors and Structures, *ESA Bull.* 95 (1998).
- (3) B. Nash, A. Nash, The Ni–Si (nickel-silicon) system, *Bull. Alloy Phase Diagr.* 8 (1987) 6–14, <https://doi.org/10.1007/BF02868885>.
- (4) C. Iwamoto, S.I. Tanaka, Reactive wetting of Ag–Cu–Ti on SiC in HRTEM, *Acta Mater.* 46 (1998) 2381–2386, [https://doi.org/10.1016/S1359-6454\(98\)80019-0](https://doi.org/10.1016/S1359-6454(98)80019-0).
- (5) C. Rado, S. Kalogeropoulou, N. Eustathopoulos, Wetting and bonding of Ni-Si alloys on silicon carbide, *Acta Mater.* 47 (1999) 461–473, [https://doi.org/10.1016/S1359-6454\(98\)00374-7](https://doi.org/10.1016/S1359-6454(98)00374-7).
- (6) D. Han, H. Mei, S. Xiao, K.G. Dassios, L. Cheng, A review on the processing technologies of carbon nanotube/silicon carbide composites, *J. Eur. Ceram. Soc.* 38 (2018) 3695–3708, <https://doi.org/10.1016/j.jeurceramsoc.2018.04.033>.
- (7) E. Neubauer, M. Kitzmantel, M. Hulman, P. Angerer, Potential and challenges of metal-matrix-composites reinforced with carbon nanofibers and carbon nanotubes, *Compos. Sci. Technol.* 70 (2010) 2228–2236, <https://doi.org/10.1016/j.compscitech.2010.09.003>.
- (8) F. Buffenoir, C. Zeppa, T. Pichon, F. Girard, Development and flight qualification of the C–SiC thermal protection systems for the IXV, *Acta Astronaut.* 124 (2016) 85–89, <https://doi.org/10.1016/j.actaastro.2016.02.010>.
- (9) G.W. Liu, F. Valenza, M.L. Muolo, A. Passerone, SiC/SiC and SiC/Kovar joining by Ni-Si and Mo interlayers, *J. Mater. Sci.* 45 (2010) 4299–4307, <https://doi.org/10.1007/s10853-010-4337-3>.
- (10) H. Dong, S. Li, Y. Teng, W. Ma, Joining of SiC ceramic-based materials with ternary carbide  $Ti_3SiC_2$ , *Mater. Sci. Eng. B* 176 (2011) 60–64, <https://doi.org/10.1016/j.mseb.2010.09.002>.
- (11) H. Long, S. Mao, Y. Liu, Z. Zhang, X. Han, Microstructural and compositional design of Ni-based single crystalline superalloys - a review, *J. Alloy. Compd.* 743 (2018) 203–220, <https://doi.org/10.1016/j.jallcom.2018.01.224>.
- (12) H. Shi, Y. Chai, N. Li, J. Yan, X. Zhu, K. Chen, D. Bai, Z. Liu, M. Wu, R. Zhang, M. Li, M. Luo, Q. Sun, C. Xin, W. Hu, X. Dong, Interfacial reaction mechanism of SiC joints

- joined by pure nickel foil, *J. Eur. Ceram. Soc.* 40 (2020) 5162–5171, <https://doi.org/10.1016/j.jeurceramsoc.2020.07.048>.
- (13) H.B. Zhang, Y.W. Bao, Y.C. Zhou, Current status in layered ternary carbide  $Ti_3SiC_2$ , a review, *J. Mater. Sci. Technol.* 25 (2009) 1–38. <https://www.jmst.org/EN/abstract/abstract8407.shtml>.
- (14) J. Cho, A.R. Boccaccini, M.S.P. Shaffer, Ceramic matrix composites containing carbon nanotubes, *J. Mater. Sci.* 44 (8) (2009) 1934–1951, <https://doi.org/10.1007/s10853-009-3262-9>.
- (15) J. Gonzalez-Julian, Processing of MAX phases: from synthesis to applications, *J. Am. Ceram. Soc.* 104 (2021) 659–690, <https://doi.org/10.1111/jace.17544>.
- (16) J. Li, L. Liu, Y. Wu, Z. Li, W. Zhang, W. Hu, Microstructure of high-temperature Ti based brazing alloys and wettability on SiC ceramic, *Mater. Des.* 30 (2009) 275–279, <https://doi.org/10.1016/j.matdes.2008.04.070>.
- (17) J. Yang, J. Huang, Z. Ye, S.H. Chen, R. Ji, Y. Zhao, Influence of interfacial reaction on reactive wettability of molten Ag-Cu-X wt% Ti filler metal on SiC ceramic substrate and mechanism analysis, *Appl. Surf. Sci.* 436 (2018) 768–778, <https://doi.org/10.1016/j.apsusc.2017.12.106>.
- (18) J.C. Bae, K.Y. Cho, D.H. Yoon, S.S. Baek, J.K. Park, J.I. Kim, D.W. Im, D.H. Riu, Highly efficient densification of carbon fiber-reinforced SiC-matrix composites by melting infiltration and pyrolysis using polycarbosilane, *Ceram. Int.* 39 (2013) 5623–5629, <https://doi.org/10.1016/j.ceramint.2012.12.078>.
- (19) J.G. Heinrich, F. Aldinger, Ceramic materials and components for engines, in R. Gadow, M. Speicher (Eds.), *Multilayer C/SiC Composites for Automotive Brake Systems*, Wiley-VCH, 2001, pp. 565–570, <https://doi.org/10.1002/9783527612765.ch96>.
- (20) J.R. McDermid, R.A.L. Drew, Thermodynamic brazing alloy design for joining silicon carbide, *J. Am. Ceram. Soc.* 74 (1991) 1855–1860, <https://doi.org/10.1111/j.1151-2916.1991.tb07799.x>.
- (21) K. Bhanumurthya, R. Schmid-Fetzer, Interface reactions between silicon carbide and metals (Ni, Cr, Pd, Zr), *Compos. A Appl. Sci. Manuf.* 32 (2001) 569–574, [https://doi.org/10.1016/S1359-835X\(00\)00049-X](https://doi.org/10.1016/S1359-835X(00)00049-X).
- (22) K. Malek, M. Sahimi, Molecular dynamics simulations of adsorption and diffusion of gases in silicon-carbide nanotubes, *J. Chem. Phys.* 132 (2010), 014310, <https://doi.org/10.1063/1.3284542>.

- (23) K. Sarkar, S. Sarkar, P.K. Das, Spark plasma sintered multiwalled carbon nanotube/silicon carbide composites: densification, microstructure, and tribo-mechanical characterization, *J. Mater. Sci.* 51 (2016) 6697–6710, <https://doi.org/10.1007/s10853-016-9956-x>.
- (24) L. Kaufman, Coupled phase diagrams and thermochemical data for transition metal binary systems-VI, *CALPHAD* 3 (1979) 45–76, [https://doi.org/10.1016/0364-5916\(79\)90020-8](https://doi.org/10.1016/0364-5916(79)90020-8).
- (25) L. Tian, L. Zheng, L. Ren, Q. Chen, Future prospects of carbon nanotubes reinforced metal matrix composite, *Res. Dev. Mater. Sci.* 3 (2018) 226–228, <https://doi.org/10.31031/RDMS.2018.03.000555>.
- (26) L. Zhang, K.N. Tu, Structure and properties of lead-free solders bearing micro and nanoparticles, *Mater. Sci. Eng. R Rep.* 82 (2014) 1–32, <https://doi.org/10.1016/j.mser.2014.06.001>.
- (27) L.F.M. Dasilva, T.N.S.S. Rodrigues, M.A.V. Figueiredo, M.F.S.F. Demoura, J.A. G. Chousal, Effect of adhesive type and thickness on the lap shear strength, *J. Adhes.* 82 (2007) 1091–1115, <https://doi.org/10.1080/00218460600948511>.
- (28) M. Hajiaboutalebi, M. Rajabi, O. Khanali, Physical and mechanical properties of SiC-CNTs nano-composites produced by a rapid microwave process, *J. Mater. Sci. Mater. Electron.* 28 (2017) 8986–8992, <https://doi.org/10.1007/s10854-017-6629-8>.
- (29) M. Patel, V. Singh, S. Singh, V.V. Bhanu Prasad, Micro-structural evolution during diffusion bonding of C-SiC/C-SiC composite using Ti interlayer, *Mater. Charact.* 135 (2018) 71–75, <https://doi.org/10.1016/j.matchar.2017.11.031>.
- (30) M. Salvo, M. Ferraris, P. Lemoine, M.A. Montorsi, M. Merola, Joining of CMCs for thermonuclear fusion applications, *J. Nucl. Mater.* 233 (1996) 949–953, [https://doi.org/10.1016/S0022-3115\(96\)00148-1](https://doi.org/10.1016/S0022-3115(96)00148-1).
- (31) M. Singh, T. Matsunaga, H.T. Lin, R. Asthana, T. Ishikaw, Microstructure and mechanical properties of joints in sintered SiC fiber-bonded ceramics brazed with Ag–Cu–Ti alloy, *Mater. Sci. Eng. A* 557 (2012) 69–76, <https://doi.org/10.1016/j.msea.2012.05.110>.
- (32) M. Xu, H. Liu, H. Zhao, W. Li, How to decrease the viscosity of suspension with the second fluid and nanoparticles? *Sci. Rep.* 3 (2013) 3137, <https://doi.org/10.1038/srep03137>.
- (33) M. Yang, L. Zhang, X. Tian, Y. Liu, P. He, J. Feng, Interfacial microstructure and mechanical properties of TiAl and C/SiC joint brazed with TiH<sub>2</sub>–Ni–B brazing powder, *Mater. Charact.* 79 (2013) 52–59, <https://doi.org/10.1016/j.matchar.2013.02.010>.

- (34) M.J.N.V. Prasad, A.H. Chokshi, On the exothermic peak during annealing of electrodeposited nanocrystalline nickel, *Scr. Mater.* 64 (2011) 544–547, <https://doi.org/10.1016/j.scriptamat.2010.11.038>.
- (35) O. Dezellus, R. Voytovych, A.P.H. Li, G. Constantin, F. Bosselet, J.C. Viala, Wettability of  $\text{Ti}_3\text{SiC}_2$  by Ag–Cu and Ag–Cu–Ti melts, *J. Mater. Sci.* 45 (2010) 2080–2084, <https://doi.org/10.1007/s10853-009-3941-6>.
- (36) P. Tatarko, V. Casalegno, C. Hu, M. Salvo, M. Ferraris, M.J. Reece, Joining of CVD-  $\text{SiC}$  coated and uncoated fibre reinforced ceramic matrix composites with pre-sintered  $\text{Ti}_3\text{SiC}_2$  MAX phase using Spark Plasma Sintering, *J. Eur. Ceram. Soc.* 36 (2016) 3957–3967, <https://doi.org/10.1016/j.jeurceramsoc.2016.06.025>.
- (37) P. Wan, M. Li, K. Xu, H.B. Wu, K.K. Chang, X.B. Zhou, X.D. Ding, Z.R. Huang, H. X. Zong, Q. Huang, Seamless joining of silicon carbide ceramics through an sacrificial interlayer of  $\text{Dy}_3\text{Si}_2\text{C}_2$ , *J. Eur. Ceram. Soc.* 39 (2019) 5457–5462, <https://doi.org/10.1016/j.jeurceramsoc.2019.09.002>.
- (38) P.K. Gianchandani, V. Casalegno, F. Smeacetto, M. Ferraris, Pressure-less joining of C/SiC and SiC/SiC by a  $\text{MoSi}_2/\text{Si}$  composite, *Int. J. Appl. Ceram. Technol.* 14 (2017) 305–312, <https://doi.org/10.1111/ijac.12631>.
- (39) R.I. Rubel, M.H. Ali, M.A. Jafor, M.M. Alam, Carbon nanotubes agglomeration in reinforced composites: a review, *AIMS Mater. Sci.* 6 (2019) 756–780, <https://doi.org/10.3934/mater.2019.5.756>.
- (40) R.L. Mehan, R.B. Bolon, Interaction between silicon carbide and a nickel-based superalloy at elevated temperatures, *J. Mater. Sci.* 14 (1979) 2471–2481, <https://doi.org/10.1007/BF00737038>.
- (41) S. Morozumi, M. Endu, M. Kikuchi, K. Hamajima, Bonding mechanism between silicon carbide and reactive metals, *J. Mater. Sci.* 20 (1985) 3976–3982, <https://doi.org/10.1007/BF00552387>.
- (42) S. Nam, H.W. Lee, I.H. Jung, Y.M. Kim, Microstructural characterization of TiC-reinforced metal matrix composites fabricated by laser cladding using FeCrCoNiAlTiC high entropy alloy powder, *Appl. Sci.* 11 (2021) 6580, <https://doi.org/10.3390/app11146580>.
- (43) S. Reich, C. Thomsen, J. Maultzsch, Carbon nanotubes-basic concepts and physical properties, *Chem Phys Chem* 5 (2004) 1914–1915, <https://doi.org/10.1002/cphc.200400387>.

- (44) S. Schmidt, S. Beyer, H. Knabe, H. Immich, R. Meistring, A. Gessler, Advanced ceramic matrix composite materials for current and future propulsion technology applications, *Acta Astronaut.* 55 (2004) 409–420, <https://doi.org/10.1016/j.actaastro.2004.05.052>.
- (45) T. Taguchi, N. Igawa, H. Yamamoto, Synthesis of silicon carbide nanotubes, *J. Am. Ceram. Soc.* 88 (2005) 459–461, <https://doi.org/10.1111/j.1551-2916.2005.00066.x>.
- (46) W. Guo, H. Zhang, W. Yuan, Y. Zhu, H. Zhang, P. Peng, B. Qi, F. Li, The microstructure and mechanical properties of C/C composite/Ti<sub>3</sub>Al alloy brazed joint with graphene nanoplatelet strengthened Ag-Cu-Ti filler, *Ceram. Int.* 45 (2019) 8783–8789, <https://doi.org/10.1016/j.ceramint.2019.01.203>.
- (47) W. Tillmanna, J. Pfeiffera, N. Sieversa, K. Boettcher, Analyses of the spreading kinetics of AgCuTi melts on silicon carbide below 900°C, using a large-chamber SEM, *Colloids Surf. A* 468 (2015) 167–173, <https://doi.org/10.1016/j.colsurfa.2014.12.039>.
- (48) X. Dai, J. Cao, Z. Chen, X. Song, J. Feng, Brazing SiC ceramic using novel B<sub>4</sub>C reinforced Ag–Cu–Ti composite filler, *Ceram. Int.* 42 (2016) 6319–6328, <https://doi.org/10.1016/j.ceramint.2016.01.021>.
- (49) X. Shi, X. Jin, H. Lin, J. Jing, L. Li, C. Wang, Joining of SiC nanowires-toughened SiC coated C/C composites and nickel based superalloy (GH3044) using Ni<sub>71</sub>CrSi interlayer, *J. Alloy. Compd.* 693 (2017) 837–842, <https://doi.org/10.1016/j.jallcom.2016.09.245>.
- (50) X.B. Zhou, Y.H. Han, X.F. Shen, et al., Fast joining SiC ceramics with Ti<sub>3</sub>SiC<sub>2</sub> tape film by electric field-assisted sintering Technol, *J. Nucl. Mater.* 466 (2015) 322–327. <https://doi.org/10.1016/j.jnucmat.2015.08.004>.
- (51) Y. Maniwa, R. Fujiwara, H. Kira, H. Tou, E. Nishibori, M. Takata, M. Sakata, A. Fujiwara, X. Zhao, S. Iijima, Y. Ando, Multiwalled carbon nanotubes grown in hydrogen atmosphere: an x-ray diffraction study, *Phys. Rev. B* 64 (2001), 073105, <https://doi.org/10.1103/PhysRevB.64.073105>.
- (52) Y. Zhou, D. Liu, X. Song, J. Liu, Y. Song, Z. Wang, J. Feng, Characterization of carbon/carbon composite/Ti6Al4V joints brazed with graphene nanosheets strengthened AgCuTi filler, *Ceram. Int.* 43 (2017) 16600–16610, <https://doi.org/10.1016/j.ceramint.2017.09.049>.
- (53) Y.M. He, J. Zhang, Y. Sun, C.F. Liu, Microstructure and mechanical properties of the Si<sub>3</sub>N<sub>4</sub>/42CrMo steel joints brazed with Ag–Cu–Ti+Mo composite filler, *J. Eur. Ceram. Soc.* 30 (2010) 3245–3251, <https://doi.org/10.1016/j.jeurceramsoc.2010.07.005>.

- (54) Z. Fathian, A. Maleki, B. Niroumand, Synthesis and characterization of ceramic nanoparticles reinforced lead-free solder, *Ceram. Int.* 43 (2017) 5302–5310, <https://doi.org/10.1016/j.ceramint.2017.01.067>.
- (55) Z. Li, R. Wei, Q. Wen, Z. Zhong, K. Song, Y. Wu, Microstructure and mechanical properties of SiC ceramic joints vacuum brazed with in-situ formed SiC particulate reinforced Si-24Ti alloy, *Vacuum* 173 (2020), 109160, <https://doi.org/10.1016/j.vacuum.2019.109160>.
- (56) Z. Wen, Y. Zhao, H. Hou, L. Chen, First-principles investigation of mechanical and thermodynamic properties of nickel silicides at finite temperature, *Phys. Solid State* 60 (2018) 967–974, <https://doi.org/10.1134/S1063783418050360>.
- (57) Z. Wang, Y. Liu, H. Zhang, J. Jiang, T. Lin, X. Liu, Z. Huang, Joining of SiC ceramics using the Ni-Mo filler alloy for heat exchanger applications, *J. Eur. Ceram. Soc.* 41 (2021) 7533–7542, <https://doi.org/10.1016/j.jeurceramsoc.2021.07.056>.

**References:**

- (1) A. Kamal, A.K. Shukla, V.M. Shinde, B.V. Rajasekhar, Microstructure and mechanical properties of C/SiC-niobium alloy (C103) joint brazed with TiCuAg alloy for aerospace applications, *Ceram. Int.* 49 (2023) 29265-29273. <https://doi.org/10.1016/j.ceramint.2023.06.218>.
- (2) A. Kamal, A.K. Shukla, V.M. Shinde, High-strength C/SiC joints prepared using a novel Ni-Si-CNTs-based filler, *J. Eur. Ceram. Soc.* 43 (2023) 7411-7421. <https://doi.org/10.1016/j.jeurceramsoc.2023.08.024>.
- (3) B. Zhou, J. Wang, K. Feng, Y. Cai, S. Chen, Effect of Brazing Parameters on the Microstructure and Properties of SiC Ceramic Joint with Zr-Cu Filler Metal, *Crystals* 10 (2020) 93. <https://doi.org/10.3390/cryst1002009>.
- (4) B.J. Kullen, N.M. Levitz, M.J. Steindler, Management of waste cladding hulls. Part II. An assessment of zirconium pyrophoricity and recommendations for handling waste hulls, United States N. P. (1977). <https://doi.org/10.2172/5203818>.
- (5) C. Song, T. Lin, P. He, W. Yang, D. Jia, J. Feng, Microstructure evolution and its effect on the mechanical properties of the ZrC–SiC composite joint diffusion bonded with pure Ni foil, *Ceram. Int.* 40 (2014) 17-23. <https://doi.org/10.1016/j.ceramint.2013.04.074>.
- (6) D. Chen, H. Gu, A. Huang, Y. Deng, Z. Shao, Incorporating Zr combined Si and C to achieve self-repairing ability and enhancement of silica sol bonded SiC castables, *J. Alloys Compd.* 732 (2018) 396-405. <https://doi.org/10.1016/j.jallcom.2017.10.233>.
- (7) D. Sciti, A. Bellosi, L. Esposito, Bonding of zirconia to superalloy with the active brazing technique, *J. Eur. Ceram. Soc.* 21 (2001) 45–52. [https://doi.org/10.1016/S0955-2219\(00\)00162-X](https://doi.org/10.1016/S0955-2219(00)00162-X).
- (8) D. Vedela, O. Grigoriev, P. Mazur, A. Osipov, M. Brodnikovskiy, L. Silvestronib, Effect of Mo<sub>2</sub>C addition on the mechanical properties and oxidation resistance of ZrB<sub>2</sub>-SiC ceramics, *J. Alloys Compd.* 879 (2021) 160398. <https://doi.org/10.1016/j.jallcom.2021.160398>.
- (9) E. Kurimoto, H. Harima, T. Toda, M. Sawada, M. Iwami, S. Nakashima, Raman study on the Ni/SiC interface reaction, *J. Appl. Phys.* 91 (2002) 10215. <https://doi.org/10.1063/1.1473226>.
- (10) F. Moszner, G. Mata-Osoro, M. Chiodi, J. Janczak-Rusch, G. Blugan, J. Kuebler, Mechanical behaviour of SiC joints brazed using an active Ag–Cu–In–Ti braze at

- elevated temperatures. *Int J Appl Ceram Technol* 14 (2017) 703–711. <https://doi.org/10.1111/ijac.12689>.
- (11) F.J. Guo, Y.F. Wang, M.S. Wang, Q. He, H. Ran, C.X. Huang, Y.T. Zhu, Hetero-deformation induced strengthening and toughening of pure iron with inverse and multi-gradient structures, *Mater. Sci. Eng. A* 782 (2020) 139256. <https://doi.org/10.1016/j.msea.2020.139256>.
- (12) G. Wang, Y. Yang, R. He, C. Tan, M. Huttula, W. Cao, A novel high entropy CoFeCrNiCu alloy filler to braze SiC ceramics, *J. Eur. Ceram. Soc.* 40 (2020) 3391–3398. <https://doi.org/10.1016/j.jeurceramsoc.2020.03.044>.
- (13) H. Long, S. Mao, Y. Liu, Z. Zhang, X. Han, Microstructural and compositional design of Ni-based single crystalline superalloys - A review, *J. Alloys Compd.* 743 (2018) 203–220. <https://doi.org/10.1016/j.jallcom.2018.01.224>.
- (14) H. Shi, H. Peng, J. Yan, R., N. Li, Y. Wen, D. Bai, Z. Liu, Y. Chai, R. Zhang, M. Li, K. Chen, M. Luo, Q. Sun, R. Li, X. Dong, Investigations of the effect of Si addition on graphite elimination and the oxidation behaviour of SiC joint using Inconel 625 powder filler, *J. Eur. Ceram. Soc.* 42 (2022) 1258–1271. <https://doi.org/10.1016/j.jeurceramsoc.2021.11.055>.
- (15) H. Shi, H. Peng, Y. Chai, N. Li, Y. Wen, D. Bai, Z. Liu, J. Yan, R. Zhang, M. Li, K. Chen, M. Luo, Q. Sun, R. Li, X. Dong, Effect of Zr addition on the interfacial reaction of the SiC joint brazed by Inconel 625 powder filler, *J. Eur. Ceram. Soc.* 41 (2021) 6238–6247.
- (16) H. Shi, Y. Chai, N. Li, J. Yan, H. Peng, R. Zhang, M. Li, D. Bai, K. Chen, Z. Liu, M. Luo, Q. Sun, X. Zhu, Y. Zhang, R. Li, B. Zhang, X. Dong, Investigation of interfacial reaction mechanism between SiC and Inconel 625 superalloy using thermodynamic calculation, *J. Eur. Ceram. Soc.* 41 (2021) 3960–3969. <https://doi.org/10.1016/j.jeurceramsoc.2021.02.046>.
- (17) H. Shi, Y. Chai, N. Li, J. Yan, X. Zhu, K. Chen, D. Bai, Z. Liu, M. Wu, R. Zhang, M. Li, M. Luo, Q. Sun, C. Xin, W. Hu, X. Dong, Interfacial reaction mechanism of SiC joints joined by pure nickel foil, *J. Eur. Ceram. Soc.* 40 (2020) 5162–5171. <https://doi.org/10.1016/j.jeurceramsoc.2020.07.048>.
- (18) H.B. Ma, J.X. Xue, J.H. Zhai, T. Liu, Q.S. Ren, Y.H. Liao, L.X. Wu, W.M. Guo, S.K. Sun, H.T. Lin, Pressureless joining of silicon carbide using  $Ti_3SiC_2$  MAX phase at 1500°C, *Ceram. Int.* 46 (2020) 14269–14272. <https://doi.org/10.1016/j.ceramint.2020.02.155>.

- (19) H.X. Li, Z.Q. Wang, Z.H. Zhong, Q. Wen, K.J. Song, H.B. Zhang, Y.C. Wu, Microalloying effects of yttrium on the microstructure and strength of silicon carbide joint brazed with chromium-silicon eutectic alloy, *J. Alloys Compd.* 738 (2018) 354-362. <https://doi.org/10.1016/j.jallcom.2017.12.137>.
- (20) J.C. Feng, H.J. Liu, M. Naka, J.C. Schester, Reaction products and growth kinetics during diffusion bonding of SiC ceramic to Ni-Cr alloy, *Mater Sci Technol* 19 (2003) 137-142. <https://doi.org/10.1179/174328413X13789825316707>.
- (21) J.G. Valenzuela, A. Bertarelli, F. Carra, N. Mariani, S. Bizzaro, R. Arenal, Development and properties of high thermal conductivity molybdenum carbide - graphite composites, *Carbon* 135 (2018) 72-84. <https://doi.org/10.1016/j.carbon.2018.04.010>.
- (22) L. Kaufman, Coupled phase diagrams and thermochemical data for transition metal binary systems-VI, *CALPHAD* 3 (1979) 45-76. [https://doi.org/10.1016/0364-5916\(79\)90020-8](https://doi.org/10.1016/0364-5916(79)90020-8).
- (23) L. Zhang, K.N. Tu, Structure and properties of lead-free solders bearing micro and nanoparticles, *Mater. Sci. Eng. R Rep.* 82 (2014) 1-32, <http://dx.doi.org/10.1016/j.mser.2014.06.001>.
- (24) L.L. Snead, T. Nozawa, Y. Katoh, T.S. Byun, S. Kondo, D.A. Petti, Handbook of SiC properties for fuel performance modelling, *J. Nucl. Mater.* 371 (2007) 329-377, <https://doi.org/10.1016/j.jnucmat.2007.05.016>.
- (25) L.X. Wu, J.X. Xue, J.H. Zhai, H.B. Ma, Y. Liu, Q.S. Ren, Y.H. Liao, S.K. Sun, W.M. Guo, L.L. Zhu, H.T. Lin, The improved SiC joints prepared by pressureless braze joining using Ti-Si interlayer with metallic infiltration, *Ceram. Int.* 48 (2022) 37049-37054. <https://doi.org/10.1016/j.ceramint.2022.08.279>.
- (26) M. Groschner, P. Ettmayer, W. Lengauer, and H. Kolaska, The melting behaviour of Ni-Mo-C and Co-Mo-C alloys, *Rev. Metall.* 91(1994) 1767-1775. <https://doi.org/10.1051/metal/199491121767>.
- (27) M. Liu, J. Zheng, Y. Lu, Z. Li, Y. Zou, X. Yu, X. Zhou, Investigation on corrosion behaviour of Ni-based alloys in molten fluoride salt using synchrotron radiation techniques, *J. Nucl. Mater.* 440 (2013) 124-128. <https://doi.org/10.1016/j.jnucmat.2013.04.056>.
- (28) M. Singh, D.R. Behrendt, Reactive melt infiltration of silicon-niobium alloys in microporous carbons, *J. Mater. Res.* 9 (1994) 1701-1708. <https://doi.org/10.1557/JMR.1994.1701>.

- (29) M. Xu, H. Liu, H. Zhao, W. Li, How to Decrease the Viscosity of Suspension with the Second Fluid and Nanoparticles?, *Sci. Rep.* 3 (2013) 3137. <https://doi.org/10.1038/srep03137>.
- (30) P. Tao, Y. Wang, Fabrication of highly dense three-layer SiC cladding tube by chemical vapour infiltration method, *J. Am. Ceram. Soc.* 102 (2019) 6939–6945, <https://doi.org/10.1111/jace.16552>.
- (31) P. Tatarko, V. Casalegno, C. Hu, M. Salvo, M. Ferraris, M.J. Reece, Joining of CVD-SiC coated and uncoated fibre reinforced ceramic matrix composites with pre-sintered  $Ti_3SiC_2$  MAX phase using Spark Plasma Sintering, *J. Eur. Ceram. Soc.* 36 (2016) 3957–3967. <https://doi.org/doi:10.1016/j.jeurceramsoc.2016.06.025>.
- (32) S.G.K. Manikandan, D. Sivakumar, M. Kamaraj, Welding the Inconel 718 Superalloy: Reduction of Micro-segregation and Laves Phases, Elsevier (2019). <https://doi.org/10.1016/C2018-0-01653-9>.
- (33) T. Epicier, J. Dubois, C. Esnouf, G. Fantozzi, P. Convert, Neutron powder diffraction studies of transition metal hemicarbides  $M_2C_{1-x}$ -II. In situ high-temperature study on  $W_2C_{1-x}$  and  $Mo_2C_{1-x}$ , *Acta Metall.* 36 (1988) 1903–1921. [https://doi.org/10.1016/0001-6160\(88\)90293-3](https://doi.org/10.1016/0001-6160(88)90293-3).
- (34) W. Fu, X. Song, R. Tian, Y. Lei, W. Long, S. Zhong, J. Fenga, Wettability and joining of SiC by Sn-Ti: Microstructure and mechanical properties, *J. Mater. Sci. Technol.* 40 (2020) 15–23. <https://doi.org/10.1016/j.jmst.2019.08.040>.
- (35) W.B. Tian, Z.M. Sun, P. Zhang, Y.M. Zhang, J. Shi, Brazing of silicon carbide ceramics with Ni-Si-Ti powder mixtures, *J. Aust. Ceram. Soc.* 53 (2017) 511–516. <https://doi.org/10.1007/s41779-017-0061-7>.
- (36) X. Hernandez, C. Jiménez, K. Mergia, P. Yialouris, S. Messoloras, V. Liedtke, C. Wilhelmi, J. Barcena, An innovative joint structure for brazing  $C_f/SiC$  composite to titanium alloy, *Mater. Eng. Perform.* 23 (2014) 3069–3076. <https://doi.org/10.1007/s11665-014-1074-9>.
- (37) X. Yin, S. He, L. Zhang, S. Fan, L. Cheng, G. Tian, T. Li, Fabrication and characterization of a carbon fibre-reinforced carbon–silicon carbide–titanium silicon carbide hybrid matrix composite, *Mater. Sci. Eng. A* 527 (2010) 835–841. <https://doi.org/10.1016/j.msea.2009.08.069>.
- (38) Y. Cao, L. Nyborg, D.Q. Yi, U. Jelvestam, Study of reaction process on Ni/4H-SiC contact, *Mater. Sci. Technol.* 22 (2006) 1227–1234. <https://doi.org/10.1179/174328406X118276>.

- (39) Y. Katoh, K. Ozawa, C. Shih, T. Nozawa, R. J. Shinavski, A. Hasegawa, L. L. Snead, Continuous SiC fibre, CVI SiC matrix composites for nuclear applications: Properties and irradiation effects, *J. Nucl. Mater.* 448 (2014) 448-476. <http://dx.doi.org/10.1016/j.jnucmat.2013.06.040>.
- (40) Y. Liu, G. Wang, Y. Zhao, M. Wang, R. He, C. Tan, W. Wang, X. Zhou, Joining of SiC using CoFeCrNiCuTi high entropy alloy filler by electric current field assisted sintering, *J. Eur. Ceram. Soc.* 42 (2022) 1995-2003. <https://doi.org/10.1016/j.jeurceramsoc.2021.12.063>.
- (41) Y. Liu, Y. Zhu, Y. Yang, X. Liu, Z. Huang, Microstructure of reaction layer and its effect on the joining strength of SiC/SiC joints brazed using Ag–Cu–In–Ti alloy. *J Adv Ceram* 3 (2014) 71–75. <https://doi.org/10.1007/s40145-014-0095-z>.
- (42) Y. Liu, Z. R. Huang, X. J. Liu, Joining of sintered silicon carbide using ternary Ag–Cu–Ti active brazing alloy, *Ceram. Int.* 35 (2009) 3479–3484. <https://doi.org/10.1016/j.ceramint.2009.03.016>.
- (43) Y. Song, D. Liu, S. Hu, X. Song, J. Cao, Graphene nanoplatelets reinforced AgCuTi composite filler for brazing SiC T ceramic, *J. Eur. Ceram. Soc.* 39 (2019) 696–704. <https://doi.org/10.1016/j.jeurceramsoc.2018.11.046>
- (44) Y. Song, D. Liu, X. Song, S. Hu, J. Cao, In-situ synthesis of TiC nanoparticles during joining of SiC ceramic and GH99 superalloy, *J. Am. Ceram. Soc.* 102 (2019) 6529-6541. <https://doi.org/10.1111/jace.16541>.
- (45) Y.N. Regmi, B.M. Leonard, General synthesis method for bimetallic carbides of group VIIIA first row transition metals with molybdenum and tungsten, *Chem. Mater.* 26 (8) (2014) 2609–2616. <https://doi.org/10.1021/cm500076v>.
- (46) Z. Fathian, A. Maleki, B. Niroumand, Synthesis and characterization of ceramic nanoparticles reinforced lead-free solder, *Ceram. Int.* 43 (2017) 5302–5310, <http://dx.doi.org/10.1016/j.ceramint.2017.01.067>.
- (47) Z. Li, R. Wei, Q. Wen, Z. Zhong, K. Song, Y. Wu, Microstructure and mechanical properties of SiC ceramic joints vacuum brazed with in-situ formed SiC particulate reinforced Si–24Ti alloy, *Vacuum* 173 (2020) 109160, <https://doi.org/10.1016/j.vacuum.2019.109160>.
- (48) Z. Wang, Y. Liu, H. Zhang, J. Jiang, T. Lin, X. Liu, Z. Huang, Joining of SiC ceramics using the Ni-Mo filler alloy for heat exchanger applications, *J. Eur. Ceram. Soc.* 41 (2021) 7533-7542. <https://doi.org/10.1016/j.jeurceramsoc.2021.07.056>.

## Publications

### Published:

**Anurag Kamal**, Anoop Kumar Shukla, Vijay M. Shinde, Buragadda V. Rajasekhar, *Microstructure and mechanical properties of C/SiC-niobium alloy (C103) joint brazed with TiCuAg alloy for aerospace applications*, *Ceramics International* 49 (2023) 29265–29273. <https://doi.org/10.1016/j.ceramint.2023.06.218>.

**Anurag Kamal**, Anoop Kumar Shukla, Vijay M. Shinde, *High-strength C/SiC joints prepared using a novel Ni-Si-CNTs-based filler*, *Journal of the European Ceramic Society* 43 (2023) 7411–7421. <https://doi.org/10.1016/j.jeurceramsoc.2023.08.024>.

**Anurag Kamal**, Anoop K. Shukla, Vijay M. Shinde, S. D. Yadav, *Effect of Mo addition on interfacial microstructure and mechanical property of SiC joint brazed by Ni-Si filler*, *Journal of the American Ceramic Society* 107 (2024) 2861-2876 . <https://doi.org/10.1111/jace.19677>.

### Under preparation:

**Anurag Kamal**, Aniket B. Jadhav, Vijay M. Shinde, Mahendra K. Pal, Anoop K. Shukla, *Effect of groove-like structures on the microstructure and mechanical property of C/SiC-C103 alloy joints*.