Bibliography

[1] Abashin, A. S. (2000). Linear recursive mds codes of dimensions 2 and 3. *Discrete Mathematics and Applications*, 10(3):319–332.

[2] Alkassar, A., Geraldy, A., Pfitzmann, B., and Sadeghi, A.-R. (2002). Optimized self-synchronizing mode of operation. In *Fast Software Encryption: 8th International Workshop, FSE 2001 Yokohama, Japan, April 2–4, 2001 Revised Papers 8*, pages 78–91. Springer.

[3] Artamonov, V. A., Chakrabarti, S., Tiwari, S. K., and Markov, V. T. (2022). Algebraic properties of subquasigroups and construction of finite quasigroups. *Algebra and Logic*, 61(4):251–270.

[4] Bassham III, L. E., Rukhin, A. L., Soto, J., Nechvatal, J. R., Smid, M. E., Barker, E. B., Leigh, S. D., Levenson, M., Vangel, M., and Banks, D. L. (2010). *Sp 800-22 rev. 1a. a statistical test suite for random and pseudorandom number generators for cryptographic applications*. National Institute of Standards & Technology.

[5] Battey, M. and Parakh, A. (2013). An efficient quasigroup block cipher. *Wireless personal communications*, 73:63–76.

[6] Beckley, D. F. (1967). An optimum system with modulus 11. *The Computer Bulletin*, 11(3):213–215.

[7] Bellare, M., Desai, A., Jokipii, E., and Rogaway, P. (1997). A concrete security treatment of symmetric encryption. In *Proceedings 38th Annual Symposium on Foundations of Computer Science*, pages 394–403. IEEE.

[8] Bellare, M. and Rogaway, P. (1993). Entity authentication and key distribution. In *Annual international cryptology conference*, pages 232–249. Springer.

[9] Belousov, V. (1967). *Foundations of the Theory of Quasigroups and Loops*. Nauka, Moscow (in Russian).

[10] Belousov, V. (1981). Elements of quasigroup theory: a special course. *Kishinev State University Printing House, Kishinev*.

[11] Belousov, V. and Belyavskaya, G. (1989). Latin squares, quasigroups and their applications. *Izdat.“tiinμa”, Kishinev*.

[12] Belyavskaya, G., Izbash, V., and Mullen, G. L. (2005a). Check character systems using quasigroups: i. *Designs, Codes and Cryptography*, 37:215–227.

[13] Belyavskaya, G., Izbash, V., and Mullen, G. L. (2005b). Check character systems using quasigroups: ii. *Designs, Codes and Cryptography*, 37:405–419.

[14] Belyavskaya, G. and Mullen, G. (2005). Orthogonal hypercubes and n-ary operarions. *Quasigroups and related systems*, 13(1):73–86.

[15] Bernstein, D. J. (2009). Introduction to post-quantum cryptography. In *Post-quantum cryptography*, pages 1–14. Springer.

[16] Broecker, C., Schulz, R. H., and Stroth, G. (1997). Check character systems using chevalley groups. *Designs, Codes and Cryptography*, 10:137–143.

[17] Burton, D. M. (2010). *Abstract Algebra*. McGraw Hill.

[18] Castro, J. C. H., Sierra, J. M., Seznec, A., Izquierdo, A., and Ribagorda, A. (2005). The strict avalanche criterion randomness test. *Mathematics and Computers in Simulation*, 68(1):1–7.

[19] Ceria, M., Cossidente, A., Marino, G., and Pavese, F. (2023). On near–mds codes and caps. *Designs, Codes and Cryptography*, 91(3):1095–1110.

[20] Chauhan, D., Gupta, I., Mishra, P., and Verma, R. (2022). Construction of cryptographically strong s-boxes from ternary quasigroups of order 4. *Cryptologia*, 46(6):525–551.

[21] Chauhan, D., Gupta, I., Mishra, P., and Verma, R. (2023). An ultra-lightweight block cipher with string transformations. *Cryptologia*, pages 1–32.

[22] Chen, C. H. O., Chen, M.-S., Ding, J., Werner, F., and Yang, B.-Y. (2008). Odd-char multivariate hidden field equations. *Cryptology ePrint Archive*.

[23] Chen, M. S., Hülsing, A., Rijneveld, J., Samardjiska, S., and Schwabe, P. (2016a). From 5-pass-based identification to-based signatures. In *International Conference on the Theory and Application of Cryptology and Information Security*, pages 135–165. Springer.

[24] Chen, W. and Yang, S. (2003). Algorithm for modultion classification of mpsk signals based on cyclic cumulant invariants. *Journal of electronics and information*, 25(3):320–325.

[25] Chen, Y., Niemenmaa, M., and Vinck, A. H. (2016b). A general check digit system based on finite groups. *Designs, Codes and Cryptography*, 80(1):149–163.

[26] Chen, Y., Niemenmaa, M., Vinck, A. H., and Gligoroski, D. (2012). On some properties of a check digit system. In *2012 IEEE International Symposium on Information Theory Proceedings*, pages 1563–1567. IEEE.

[27] Cooper, J., Donovan, D., and Seberry, J. (1994). Secret sharing schemes arising from latin squares. *Bulletin of the Institute of Combinatorics and its Applications*, 12:33–43.

[28] Courtois, N. (2001). Quartz, 128-bit long digital signatures. In *Topics in Cryptology-CT-RSA 2001, The Cryptographer's Track at the RSA Conf. 2001, San Francisco, CA, USA, Proceedings, April*, pages 298–307. Springer.

[29] Couselo, E., Gonzalez, S., Markov, V., and Nechav, A. (1998). Recursive mds-codes and recursive differentiable quasigroups. *Discrete Math. Appl.*, 8(3):217–246.

[30] Damm, M. H. (2004). *Total anti-symmetrische Quasigruppen*. Ph.D Thesis Philipps-Universität Marburg.

[31] Dénes, J. (1979). Latin squares and non-binary encoding. In *Proc. conf. information theory, CNRS, Paris*, pages 215–221.

[32] Dénes, J. (2000). On latin squares and a digital encrypting communication system. *Pure Mathematics and Applications*, 11(4):559–563.

[33] Dénes, J. and Keedwell, A. D. (1976). *Latin squares and their applications*. English universities press.

[34] Dénes, J. and Keedwell, A. D. (1991). *Latin squares: New developments in the theory and applications*, volume 46. Elsevier.

[35] Dénes, J. and Keedwell, A. D. (2001). Some applications of non-associative algebraic systems in cryptology. *Pure Mathematics and Applications*, 12(2):147–195.

[36] Desai, A. (2000). New paradigms for constructing symmetric encryption schemes secure against chosen-ciphertext attack. In *Annual International Cryptology Conference*, pages 394–412. Springer.

[37] Dimitrova, V. (2010). *Quasigroup Processed Strings, their Boolean Representations and Application in Cryptography and Coding Theory*. PhD thesis, PhD Thesis, Ss. Cyril and Methodius University, Skopje, Macedonia.

[38] Ding, J., Petzoldt, A., Schmidt, D. S., Ding, J., Petzoldt, A., and Schmidt, D. S. (2020). Multivariate cryptography. *Multivariate Public Key Cryptosystems*, pages 7–23.

[39] Ding, J. and Schmidt, D. (2005). Rainbow, a new multivariable polynomial signature scheme. In *International conference on applied cryptography and network security*, pages 164–175. Springer.

[40] Ding, J., Schmidt, D., and Yin, Z. (2006). Cryptanalysis of the new tts scheme in ches 2004. *International Journal of Information Security*, 5:231–240.

[41] Dobraunig, C., Eichlseder, M., Mendel, F., and Schläffer, M. (2021). Ascon v1. 2: Lightweight authenticated encryption and hashing. *Journal of Cryptology*, 34:1–42.

[42] Dolev, D., Dwork, C., and Naor, M. (1991). Non-malleable cryptography. In *Proceedings of the twenty-third annual ACM symposium on Theory of computing*, pages 542–552.

[43] Dubois, V., Fouque, P. A., Shamir, A., and Stern, J. (2007). Practical cryptanalysis of sflash. In *Annual International Cryptology Conference*, pages 1–12. Springer.

[44] Dworkin, M. J. (2001). *Recommendation for Block Cipher Modes of Operation. Methods and Techniques*. National Institute of Standards and Technology, Gaithersburg MD Computer Security Division.

[45] Ehrsam, W. F., Meyer, C. H., Smith, J. L., and Tuchman, W. L. (1978). Message verification and transmission error detection by block chaining. US Patent 4,074,066.

[46] Ethier, J. T. and Mullen, G. L. (2012). Strong forms of orthogonality for sets of hypercubes. *Discrete Mathematics*, 312(12-13):2050–2061.

[47] Euler, L. (1849). Recherches sur une espece de carrés magiques. *Commentationes Arithmeticae Collectae*, 2:302–361.

[48] Faugère, J.-C., Gligoroski, D., Perret, L., Samardjiska, S., and Thomae, E. (2015). A polynomial-time key-recovery attack on mqq cryptosystems. In *IACR International Workshop on Public Key Cryptography*, pages 150–174. Springer.

[49] Faugère, J. C., Ødegård, R. S., Perret, L., and Gligoroski, D. (2010). Analysis of the mqq public key cryptosystem. In *Cryptology and Network Security: 9th International Conference, CANS 2010, Kuala Lumpur, Malaysia, December 12-14, 2010. Proceedings 9*, pages 169–183. Springer.

[50] Ferozpuri, A. and Gaj, K. (2018). High-speed fpga implementation of the nist round 1 rainbow signature scheme. In *2018 International Conference on ReConFigurable Computing and FPGAs (ReConFig)*, pages 1–8. IEEE.

[51] Fiat, A. and Shamir, A. (1986). How to prove yourself: Practical solutions to identification and signature problems. In *Conference on the theory and application of cryptographic techniques*, pages 186–194. Springer.

[52] FIPS, P. (1980). Des modes of operation. *Issued December*, 2:63.

[53] Fouque, P. A., Granboulan, L., and Stern, J. (2005). Differential cryptanalysis for multivariate schemes. In *Annual International Conference on the Theory and Applications of Cryptographic Techniques*, pages 341–353. Springer.

[54] Geng, X., Yang, M., Zhang, J., and Zhou, Z. (2022). A class of almost mds codes. *Finite Fields and Their Applications*, 79:101996.

[55] Gligoroski, D. (2004). Stream cipher based on quasigroup string transformations in $\mathbb{Z}_p^*$. *arXiv preprint cs/0403043*.

[56] Gligoroski, D., Dimitrova, V., and Markovski, S. (2009a). Quasigroups as boolean functions, their equation systems and gröbner bases. *Gröbner bases, coding, and cryptography*, pages 415–420.

[57] Gligoroski, D., Markovski, S., and Knapskog, S. J. (2008a). Multivariate quadratic trapdoor functions based on multivariate quadratic quasigroups. In *Proceedings of the American Conference on Applied Mathematics*, pages 44–49.

[58] Gligoroski, D., Markovski, S., and Knapskog, S. J. (2008b). A public key block cipher based on multivariate quadratic quasigroups. *arXiv preprint arXiv:0808.0247*.

[59] Gligoroski, D., Markovski, S., and Kocarev, L. (2007). Error-correcting codes based on quasigroups. In *2007 16th International Conference on Computer Communications and Networks*, pages 165–172.

[60] Gligoroski, D., Markovski, S., and Kocarev, L. (2009b). Edon-r, an infinite family of cryptographic hash functions. *Int. J. Netw. Secur.*, 8(3):293–300.

[61] Gligoroski, D., Ødegård, R. S., Jensen, R. E., Perret, L., Faugere, J. C., Knapskog, S. J., and Markovski, S. (2011). Mqq-sig: An ultra-fast and provably cma resistant digital signature scheme. *International Conference on Trusted Systems*, pages 184–203.

[62] Gligoroski, D. and Samardjiska, S. (2012). The multivariate probabilistic encryption scheme mqq-enc. *Cryptology ePrint Archive*.

[63] Goldwasser, S. and Bellare, M. (1996). Lecture notes on cryptography. *Summer course Cryptography and computer security at MIT*, 1999:1999.

[64] Goubin, L. and Courtois, N. T. (2000). Cryptanalysis of the ttm cryptosystem. In *Advances in Cryptology—ASIACRYPT 2000: 6th International Conference on the Theory and Application of Cryptology and Information Security Kyoto, Japan, December 3–7, 2000 Proceedings 6*, pages 44–57. Springer.

[65] Gray, R. M. (2006). Toeplitz and circulant matrices: A review. *Foundations and Trends® in Communications and Information Theory*, 2(3):155–239.

[66] Gumm, H. (1985). A new class of check-digit methods for arbitrary number systems (corresp.). *IEEE Transactions on information theory*, 31(1):102–105.

[67] Hashimoto, Y. (2017). On the security of hmfev. *Cryptology ePrint Archive*.

[68] Hulpke, A., Kaski, P., and Östergård, P. (2011). The number of latin squares of order 11. *Mathematics of computation*, 80(274):1197–1219.

[69] Katz, J. and Lindell, Y. (2020). *Introduction to modern cryptography*. CRC press.

[70] Keedwell, A. D. and Shcherbacov, V. A. (2003). Construction and properties of (r, s, t)-inverse quasigroups. i. *Discrete mathematics*, 266(1-3):275–291.

[71] Kipnis, A., Patarin, J., and Goubin, L. (1999). Unbalanced oil and vinegar signature schemes. In *International Conference on the Theory and Applications of Cryptographic Techniques*, pages 206–222. Springer.

[72] Kipnis, A. and Shamir, A. (1998). Cryptanalysis of the oil and vinegar signature scheme. In *Annual international cryptology conference*, pages 257–266. Springer.

[73] Kolesova, G., Lam, C. W., and Thiel, L. (1990). On the number of 8× 8 latin squares. *Journal of Combinatorial Theory, Series A*, 54(1):143–148.

[74] Krotov, D. S. (2008). On decomposability of 4-ary distance 2 mds codes, double-codes, and n-quasigroups of order 4. *Discrete mathematics*, 308(15):3322–3334.

[75] Kumar, S., Gupta, I., and Gupta, A. J. (2022). A study of public key cryptosystems based on quasigroups. *Cryptologia*, pages 1–30.

[76] Kumar, S., Singh, H., Gupta, I., and Gupta, A. J. (2023). Mds codes based on orthogonality of quasigroups. *Applicable Algebra in Engineering, Communication and Computing*, pages 1–22.

[77] Kundu, N., Debnath, S. K., Mishra, D., and Choudhury, T. (2020). Post-quantum digital signature scheme based on multivariate cubic problem. *Journal of Information Security and Applications*, 53:102512.

[78] Laywine, C. F. and Mullen, G. L. (1998). *Discrete mathematics using Latin squares*, volume 49. John Wiley & Sons.

[79] Laywine, C. F., Mullen, G. L., and Whittle, G. (1995). D-dimensional hypercubes and the euler and macneish conjectures. *Monatshefte für Mathematik*, 119(3):223–238.

[80] Lidl, R. and Niederreiter, H. (1994). *Introduction to finite fields and their applications*. Cambridge university press.

[81] Ling, S. and Xing, C. (2004). *Coding theory: a first course*. Cambridge University Press.

[82] Ma, J. and Luo, J. (2022). Constructions of mds symbol-pair codes with minimum distance seven or eight. *Designs, Codes and Cryptography*, 90(10):2337–2359.

[83] MacWilliams, F. J. and Sloane, N. J. A. (1977). *The theory of error-correcting codes*, volume 16. Elsevier.

[84] Marcus, M. and Minc, H. (1965). Permanents. *The American Mathematical Monthly*, 72(6):577–591.

[85] Markovski, S. (2003). Quasigroup string processing and applications in cryptography. In *Proc. 1-st Inter. Conf. Mathematics and Informatics for industry*, volume 1002, pages 14–16.

[86] Markovski, S. and Bakeva, V. (2017). Quasigroup string processing: Part 4. *Contributions, Section of Natural, Mathematical and Biotechnical Sciences*, 27(1-2).

[87] Markovski, S., Dimitrova, V., Trajcheska, Z., Petkovska, M., Kostadinoski, M., and Buhov, D. (2021). Block cipher defined by matrix presentation of quasigroups. *Cryptology ePrint Archive*.

[88] Markovski, S., Gligoroski, D., and Andova, S. (1997). Using quasigroups for one-one secure encoding. In *Proc. VIII Conf. Logic and Computer Science "LIRA"*, volume 97, pages 157–162. Citeseer.

[89] Markovski, S. and Mileva, A. (2017). On construction of orthogonal d-ary operations. *Publications de l'Institut Mathématique*, 101(115):109–119.

[90] Markovski, S., Mileva, A., Samardziska, S., and Jakimovski, B. (2009). Nasha. In *First SHA-3 Candidate Conference*.

[91] Matsumoto, T. and Imai, H. (1988). Public quadratic polynomial-tuples for efficient signature-verification and message-encryption. In *Advances in Cryptology—EUROCRYPT'88: Workshop on the Theory and Application of Cryptographic Techniques Davos, Switzerland, May 25–27, 1988 Proceedings 7*, pages 419–453. Springer.

[92] Menezes, A. J., Van Oorschot, P. C., and Vanstone, S. A. (2018). *Handbook of applied cryptography*. CRC press.

[93] Mohamed, M. S. E., Ding, J., and Buchmann, J. (2008). Algebraic cryptanalysis of mqq public key cryptosystem by mutantxl. *Cryptology ePrint Archive*.

[94] Mollin, R. A. and Small, C. (1987). On permutation polynomials over finite fields. *International Journal of Mathematics and Mathematical Sciences*, 10:535–543.

[95] Moufang, R. (1935). Zur struktur von alternativkörpern. *Mathematische annalen*, 110(1):416–430.

[96] Mullen, G. L. and Panario, D. (2013). *Handbook of finite fields*. CRC press.

[97] Mullen, G. L. and Shcherbacov, V. (2004). n-t-quasigroup codes with one check symbol and their error detection capabilities. *Commentationes Mathematicae Universitatis Carolinae*, 45(2):321–340.

[98] Niemenmaa, M. (2011). A check digit system for hexadecimal numbers. *Applicable Algebra in Engineering, Communication and Computing*, 22:109–112.

[99] Ochodková, E. and Snášel, V. (2001). Using quasigroups for secure encoding of file system. In *Proceedings of the International Scientific NATO PfP/PWP Conference Security and Information Protection*, pages 175–181.

[100] Patarin, J. (1995). Cryptanalysis of the matsumoto and imai public key scheme of eurocrypt'88. In *Advances in Cryptology—CRYPT0'95: 15th Annual International Cryptology Conference Santa Barbara, California, USA, August 27–31, 1995 Proceedings 15*, pages 248–261. Springer.

[101] Patarin, J. (1996). Hidden fields equations (hfe) and isomorphisms of polynomials (ip): Two new families of asymmetric algorithms. In *International Conference on the Theory and Applications of Cryptographic Techniques*, pages 33–48. Springer.

[102] Patarin, J. (1997). The oil and vinegar signature scheme. In *Presented at the Dagstuhl Workshop on Cryptography September 1997*.

[103] Patarin, J., Courtois, N., and Goubin, L. (2001a). Flash, a fast multivariate signature algorithm: http://www. minrank. org/flash. In *Topics in Cryptology—CT-RSA 2001: The Cryptographers' Track at RSA Conference 2001 San Francisco, CA, USA, April 8–12, 2001 Proceedings*, pages 298–307. Springer.

[104] Patarin, J., Courtois, N., and Goubin, L. (2001b). Quartz, 128-bit long digital signatures: http://www. minrank. org/quartz. In *Cryptographers' Track at the RSA Conference*, pages 282–297. Springer.

[105] Petzoldt, A. (2013). *Selecting and reducing key sizes for multivariate cryptography*. Ph.D Thesis, Technische Universität Darmstadt, tuprints.

[106] Petzoldt, A., Bulygin, S., and Buchmann, J. (2010). Cyclicrainbow–a multivariate signature scheme with a partially cyclic public key. In *Progress in Cryptology-INDOCRYPT 2010: 11th International Conference on Cryptology in India, Hyderabad, India, December 12-15, 2010. Proceedings 11*, pages 33–48. Springer.

[107] Petzoldt, A., Chen, M. S., Ding, J., and Yang, B. Y. (2017). Hmfev-an efficient multivariate signature scheme. In *Post-Quantum Cryptography: 8th International Workshop, PQCrypto 2017, Utrecht, The Netherlands, June 26-28, 2017, Proceedings 8*, pages 205–223. Springer.

[108] Petzoldt, A., Chen, M. S., Yang, B. Y., Tao, C., and Ding, J. (2015). Design principles for hfev-based multivariate signature schemes. In *Advances in Cryptology–ASIACRYPT 2015: 21st International Conference on the Theory and Application of Cryptology and Information Security, Auckland, New Zealand, November 29–December 3, 2015, Proceedings, Part I 21*, pages 311–334. Springer.

[109] Rogaway, P. (2011). Evaluation of some blockcipher modes of operation. *Cryptography Research and Evaluation Committees (CRYPTREC) for the Government of Japan*, 630.

[110] Roth, R. M. (2006). Introduction to coding theory. *IET Communications*, 47(18-19):4.

[111] Sakumoto, K., Shirai, T., and Hiwatari, H. (2011). Public-key identification schemes based on multivariate quadratic polynomials. In *Advances in Cryptology–CRYPTO 2011: 31st Annual Cryptology Conference, Santa Barbara, CA, USA, August 14-18, 2011. Proceedings 31*, pages 706–723. Springer.

[112] Samardjiska, S., Chen, Y., and Gligoroski, D. (2012). Algorithms for construction of multivariate quadratic quasigroups (mqqs) and their parastrophe operations in arbitrary galois fields. *Journal of Information Assurance & Security*, 7(3).

[113] Samardjiska, S., Markovski, S., and Gligoroski, D. (2010). Multivariate quasigroups defined by t-functions. In *Conference on Symbolic Computation and Cryptography*, page 117.

[114] Shafi, G. and Micali, S. (1984). Probabilistic encryption. *Journal of computer and system sciences*, 28(2):270–299.

[115] Shao, J. Y. (1992). A formula for the number of latin squares. *Discrete mathematics*, 110(1-3):293–296.

[116] Shcherbacov, V. (2017). *Elements of quasigroup theory and applications*. CRC Press.

[117] Shor, P. W. (1999). Polynomial-time algorithms for prime factorization and discrete logarithms on a quantum computer. *SIAM review*, 41(2):303–332.

[118] Smith, J. D. (2006). *An introduction to quasigroups and their representations*. CRC Press.

[119] Stinson, D. R. (2005). *Cryptography: theory and practice*. Chapman and Hall/CRC.

[120] Thomae, E. (2013). *About the security of multivariate quadratic public key schemes*. Ph.D Thesis, Ruhr-Universität Bochum, Universitätsbibliothek.

[121] Thomae, E. and Wolf, C. (2012). Cryptanalysis of enhanced tts, sts and all its variants, or: Why cross-terms are important. In *Progress in Cryptology-AFRICACRYPT 2012: 5th International Conference on Cryptology in Africa, Ifrance, Morocco, July 10-12, 2012. Proceedings 5*, pages 188–202. Springer.

[122] Tiwari, S. K., Awasthi, A., Chkrabarti, S., and Yadav, S. (2021). Inru: A quasigroup based lightweight block cipher. *arXiv preprint arXiv:2112.07411*.

[123] Vatutin, E., Belyshev, A., Kochemazov, S., Zaikin, O., and Nikitina, N. (2019). Enumeration of isotopy classes of diagonal latin squares of small order using volunteer computing. *Supercomputing: 4th Russian Supercomputing Days, RuSCDays 2018, Moscow, Russia, September 24–25, 2018, Revised Selected Papers 4*, pages 578–586.

[124] Verhoeff, J. (1969). *Error detecting decimal codes*. Mathematisch Centrum.

[125] Vojvoda, M. (2004). Stream ciphers and hash functions-analysis of some new design approaches. *PhDthesis, Slovak University of Technology*.

[126] Wang, X., Yang, B., Li, J., and Wu, H. (2019). Multivariate signature method for resisting key recovery attack. US Patent 10,461,923.

[127] Wolf, C. and Preneel, B. (2005). Taxonomy of public key schemes based on the problem of multivariate quadratic equations. *Cryptology ePrint Archive*.

[128] Wooding, M. (2008). New proofs for old modes. *Cryptology ePrint Archive*.

[129] Wu, Y., Hyun, J. Y., and Lee, Y. (2021). New lcd mds codes of non-reed-solomon type. *IEEE Transactions on Information Theory*, 67(8):5069–5078.

[130] Yang, B. Y. and Chen, J. M. (2005). Building secure tame-like multivariate public-key cryptosystems: The new tts. In *Australasian Conference on Information Security and Privacy*, pages 518–531. Springer.

[131] Zhao, Y. and Xu, Y. (2017). A lightweight block cipher based on quasigroups. In *6th International Conference on Advanced Materials and Computer Science (ICAMCS-2017)*.