References

- F.C. Campbell, Structural composite materials, ASM international, Materials Park, OH, USA, 2010.
- [2] P. Sahoo and J.P. Davim, "Tribology of ceramics and ceramic matrix composites," Tribology for Scientists and Engineers, P.L. Menezes, S.P. Ingole, M. Nosonovsky, S.V. Kailas, and M.R. Lovell MR (eds.), Springer, New York, NY, USA, 2013, pp. 211-231.
- [3] B. Basu and M. Kalin, Tribology of ceramics and composites: a materials science perspective, John Wiley & Sons, Hoboken, NJ, USA, 2011.
- [4] D. Zhang and D. Hayhurst, "Prediction of stress-strain and fracture behaviour of an 8-Harness satin weave ceramic matrix composite." *International Journal of Solids and Structures*, 2014, v. 51, pp. 3762-3775.
- [5] J. Silvestre, N. Silvestre, and J.D. Brito, "An overview on the improvement of mechanical properties of ceramics nanocomposites." *Journal of Nanomaterials*, 2015, v. 20, pp. 3-15.
- [6] H. Ishigaki, I. Kawaguchi, M. Iwasa, and Y. Toibana, "Friction and wear of hot pressed silicon nitride and other ceramics." *Journal of Tribology*, 1986, v. 108, pp. 514-521.
- [7] G. Motz and R.K. Bordia, "Processing, structure and properties of ceramic fibers," Handbook of Textile Fibre Structure, S. J. Eichhorn, J. W. S. Hearle, M. Jaffe, and T. Kikutani (eds.), Woodhead Publishing, Sawston, Cambridge, UK, 2009, pp. 378-424.
- [8] L.M. Manocha, "High performance carbon-carbon composites." *Sadhana*, 2003, v. 28, pp. 349-358.
- [9] Z. Chen, H. Li, K. Li, Q. Shen, and Q. Fu, "Influence of grain size on wear behavior of SiC coating for carbon/carbon composites at elevated temperatures." *Materials & Design*, 2014, v. 53, pp. 412-418.
- [10] P. Kumar and V.K. Srivastava, "A Review on Wear and Friction Performance of Carbon–Carbon Composites at High Temperature." *International Journal of Applied Ceramic Technology*, 2016, v. 13, pp. 702-710.
- [11] J. Chen, J.C. Lin, and C. Ju, "Effect of humidity on the tribological behavior of carboncarbon composites." *Wear*, 1996, v. 193, pp. 38-47.

- [12] W. Krenkel, B. Heidenreich, and R. Renz, "C/C-SiC Composites for Advanced Friction Systems." Advanced Engineering Materials, 2002, v. 4, pp. 427-436.
- [13] S. Fan, L. Zhang, L. Cheng, G. Tian, and S. Yang, "Effect of braking pressure and braking speed on the tribological properties of C/SiC aircraft brake materials." *Composites Science and Technology*, 2010, v. 70, pp. 959-965.
- [14] W. Krenkel, "C/C-SiC Composites for Hot Structures and Advanced Friction Systems,"
 27th Annual Cocoa Beach Conference on Advanced Ceramics and Composites: B, Hoboken, NJ, USA, 2003, pp. 583-592.
- [15] W. Krenkel and F. Berndt, "C/C–SiC composites for space applications and advanced friction systems." *Materials Science and Engineering: A*, 2005, v. 412, pp. 177-181.
- [16] Y. Shu, C. Jie, H. Qizhong, X. Xiang, C. Tong, and L. Yunping, "Effect of braking speeds on the tribological properties of carbon/carbon composites." *Materials Transactions*, 2010, v. 51, pp. 1038-1043.
- [17] M. Jacko, P. Tsang, and S. Rhee, "Automotive friction materials evolution during the past decade." *Wear*, 1984, v. 100, pp. 503-515.
- [18] S. Rhee, M. Jacko, and P. Tsang, "The role of friction film in friction, wear and noise of automotive brakes." *Wear*, 1991, v. 146, pp. 89-97.
- [19] A.G. Chrysler, "Ceramic brake discs for high performance vehicles," Daimler Chrysler High Tech Report, Stuttgart, Germany, 2000, pp. 1-119.
- [20] H.K. Shin, H.B. Lee, and K.S. Kim, "Tribological properties of pitch-based 2-D carbon– carbon composites." *Carbon*, 2001, v. 39, pp. 959-970.
- [21] R. Mohanty, "Climate based performance of carbon-carbon disc brake for high speed aircraft braking system." *Defence Science Journal*, 2013, v. 63, pp. 531-538.
- [22] A. Yaya, B.A. Tuffour, D.D. Arhin, E. Nyankson, E. Annan, D. Konadu, et al., "Layered nanomaterials-a review." *Global Journal of Engineering Design and Technology*, 2012, v. 2, pp. 32-41.
- [23] J.D. Buckley, "Carbon-Carbon overview," Carbon-carbon materials and composites, J.
 D. Buckley, and D. D. Edie (eds.), Noyes Publications, Norwich, NY, USA, 1993, pp. 1-14.
- [24] S.J. Park and G.Y. Heo, "Precursors and manufacturing of carbon fibers," Carbon Fibers, S.J. Park (ed.), Springer, New York, NY, USA, 2015, pp. 31-66.

- [25] G.R. Devi and K.R. Rao, "Carbon Carbon Composites: An Overview." *Defence Science Journal*, 1993, v. 43, pp. 369-383.
- [26] J. Ruppe, "Today and the future in aircraft wheel and brake development." *Canadian Aeronautics and Space Journal*, 1980, v. 26, pp. 209-216.
- [27] S. Awasthi and J. Wood, "C/C composite materials for aircraft brakes." Advanced Ceramic Materials, 1988, v. 3, pp. 449-451.
- [28] A. Skopp and M. Woydt, "Ceramic and ceramic composite materials with improved friction and wear properties." *Tribology Transactions*, 1995, v. 38, pp. 233-242.
- [29] H. Czichos, D. Klaffke, E. Santner, and M. Woydt, "Advances in tribology: the materials point of view." *Wear*, 1995, v. 190, pp. 155-161.
- [30] D. Chan and G.W. Stachowiak, "Review of automotive brake friction materials." Proceedings of the Institution of Mechanical Engineers, Part D: Journal of Automobile Engineering, 2004, v. 218, pp. 953-966.
- [31] P. Morgan, Carbon Fibers and their Composites. CRC Press, Florida, USA, 2005.
- [32] E. Fitzer, "The future of carbon-carbon composites." Carbon, 1987, v. 25, pp. 163-190.
- [33] C. Byrne, "Modern carbon composite brake materials." Journal of Composite Materials, 2004, v. 38, pp. 1837-1850.
- [34] G. Nicholson, Facts about friction: a friction material manual almost all you need to know about manufacturing; 100 years of brake linings & clutch facings, P&W Price Enterprises, East Hartford, Connecticut, 1995.
- [35] P. Xiao, Z. Li, Z. Zhu, and X. Xiong, "Preparation, properties and application of C/C-SiC composites fabricated by warm compacted-in situ reaction." *Journal of Materials Science & Technology*, 2010, v. 26, pp. 283-288.
- [36] B. Yen and T. Ishihara, "On temperature-dependent tribological regimes and oxidation of carbon-carbon composites up to 1800 C." *Wear*, 1996, v. 196, pp. 254-262.
- [37] K.Z. Li, J. Wang, X.B. Ren, H.J. Li, W. Li, and Z.Q. Li, "The preparation and mechanical properties of carbon–carbon/lithium–aluminum–silicate composite joints." *Materials & Design*, 2013, v. 44, pp. 346-353.
- [38] A. Westwood, B. Rand, and S. Lu, "Oxidation resistant carbon materials derived from boronated carbon–silicon alloys." *Carbon*, 2004, v. 42, pp. 3071-3080.

- [39] S.Y. Kim, I.S. Han, S.K. Woo, K.S. Lee, and D.K. Kim, "Wear-mechanical properties of filler-added liquid silicon infiltration C/C–SiC composites." *Materials & Design*, 2013, v. 44, pp. 107-113.
- [40] C. Zhang, L. Zhang, Q. Zeng, S. Fan, and L. Cheng, "Simulated three-dimensional transient temperature field during aircraft braking for C/SiC composite brake disc." *Materials & Design*, 2011, v. 32, pp. 2590-2595.
- [41] T. Policandriotes and P. Filip, "Effects of selected nanoadditives on the friction and wear performance of carbon–carbon aircraft brake composites." *Wear*, 2011, v. 271, pp. 2280-2289.
- [42] I. Stimson and R. Fisher, "Design and engineering of carbon brakes." *Philosophical Transactions of the Royal Society of London Series A, Mathematical and Physical Sciences*, 1980, v. 294, pp. 583-590.
- [43] R. Taylor, S.P. Turner, K. Garner, and X.X. Jiang, "Thermal conductivity of carbon fibres." *High Temperatures High Pressures*, 1993, v. 25, pp. 443-450.
- [44] D.G. Kim, D.W. Kweon, and J.Y. Lee, "The wear properties of carbon/carbon composites prepared by chemical vapour deposition." *Journal of Materials Science Letters*, 1993, v. 12, pp. 8-10.
- [45] V.K. Srivastava, "Wear Behaviour of C/C–SiC Composites Sliding against High-Cr Steel Discs." Zeitschrift für Metallkunde, 2003, v. 94, pp. 458-462.
- [46] H. Zhou, S. Dong, Y. Ding, Z. Wang, and D. Wu, "Friction and wear properties of 3D carbon/silicon carbide composites prepared by liquid silicon infiltration." *Tribology Letters*, 2010, v. 37, pp. 337-341.
- [47] X. Xiong, J.H. Li, and B.Y. Huang, "Impact of brake pressure on the friction and wear of carbon/carbon composites." *Carbon*, 2007, v. 13, pp. 2692-2694.
- [48] H. Guther, J. Rosenlocher, and M. Bauer, U. S. Patent No. US7419700B2, 2008.
- [49] R. Lam, Y. Chen, and K. Maruo, U. S. Patent No. US7429418B2, 2008.
- [50] X. Xiong, B.Y. Huang, J.H. Li, and H.J. Xu, "Friction behaviors of carbon/carbon composites with different pyrolytic carbon textures." *Carbon*, 2006, v. 44, pp. 463-467.
- [51] N. Murdie, C. Ju, J. Don, and F. Fortunato, "Microstructure of worn pitch/resin/CVI CC composites." *Carbon*, 1991, v. 29, pp. 335-342.

- [52] R. Luo, X. Huai, J. Qu, H. Ding, and S. Xu, "Effect of heat treatment on the tribological behavior of 2D carbon/carbon composites." *Carbon*, 2003, v. 41, pp. 2693-2701.
- [53] H. Deng, K. Li, H. Li, P. Wang, J. Xie, and L. Zhang, "Effect of brake pressure and brake speed on the tribological properties of carbon/carbon composites with different pyrocarbon textures." *Wear*, 2010, v. 270, pp. 95-103.
- [54] R. Luo and Q. Li, "Brake characteristics of 2D carbon/carbon composites prepared by rapid direction diffused CVI technology." *Materials Science and Engineering: A*, 2004, v. 379, pp. 33-38.
- [55] J. Chen and C. Ju, "Effect of sliding speed on the tribological behavior of a PAN-pitch carbon-carbon composite." *Materials Chemistry and Physics*, 1995, v. 39, pp. 174-179.
- [56] J. Chen, J.C. Lin and C. Ju, "Effect of load on tribological behaviour of carbon-carbon composites." *Journal of Materials Science*, 1996, v. 31, pp. 1221-1229.
- [57] Z.Z. Jian, P.P. Yao and P. Zhou, "Numerical calculation of temperature field of brake during aircraft braking." *Computer Simulation*, 2007, v. 9, pp. 16-23.
- [58] L. Jiqiao, H. Baiyun, S. Gang, C. Tengfei and X. Xiang, "Influence of porosity and total surface area on the oxidation resistance of C/C composites." *Carbon*, 2002, v. 40, pp. 2483-2488.
- [59] X.F. Lu and P. Xiao, "Short time oxidation behavior and residual mechanical properties of C/C composites modified by in situ grown carbon nanofibers." *Ceramics International*, 2014, v. 40, pp. 10705-10709.
- [60] K.Z. Li, Q. Song, Q. Qiang and C. Ren, "Improving the oxidation resistance of carbon/carbon composites at low temperature by controlling the grafting morphology of carbon nanotubes on carbon fibres." *Corrosion Science*, 2012, v. 60, pp. 314-317.
- [61] M. Westwood, J. Webster, R. Day, F. Hayes and R. Taylor, "Oxidation protection for carbon fibre composites." *Journal of Materials Science*, 1996, v. 31, pp. 1389-1397.
- [62] H. Jian-Feng, Z. Xie-Rong, L. He-Jun, X. Xin-Bo, and F. Ye-Wei, "Influence of the preparation temperature on the phase, microstructure and anti-oxidation property of a SiC coating for C/C composites." *Carbon*, 2004, v. 42, pp. 1517-1521.
- [63] G.B. Zheng, H. Mizuki, H. Sano, and Y. Uchiyama, "CNT–PyC–SiC/SiC double-layer oxidation-protection coating on C/C composite." *Carbon*, 2008, v. 46, pp. 1808-1811.

- [64] R. Wang, H. Sano, Y. Uchiyama, and K. Kobayashi, "Oxidation behaviours of carbon/carbon composite with multi-coatings of LaB₆-Si/polycarbosilane/SiO₂." *Journal* of Materials Science, 1996, v. 31, pp. 6163-6169.
- [65] W. Kowbel, J. Withers, and P. Ransone, "CVD and CVR Silicon-based functionally gradient coatings on C/C composites." *Carbon*, 1995, v. 33, pp. 415-426.
- [66] T. Aoki, H. Hatta, T. Hitomi, H. Fukuda, and I. Shiota, "SiC/C multi-layered coating contributing to the antioxidation of C/C composites and the suppression of throughthickness cracks in the layer." *Carbon*, 2001, v. 39, pp. 1477-1483.
- [67] O. Yamamoto, T. Sasamoto, and M. Inagaki, "Antioxidation of carbon-carbon composites by SiC concentration gradient and zircon overcoating." *Carbon*, 1995, v. 33, pp. 359-365.
- [68] H. Jian-Feng, Z. Xie-Rong, L. He-Jun, L. Ke-Zhi, and X. Xin-Bo, "Oxidation behavior of SiC–Al2O3-mullite multi-coating coated carbon/carbon composites at high temperature." *Carbon*, 2005, v. 7, pp. 1580-1583.
- [69] X. Ren, H. Li, Q. Fu, and K. Li, "Ultra-high temperature ceramic TaB2–TaC–SiC coating for oxidation protection of SiC-coated carbon/carbon composites." *Ceramics International*, 2014, v. 40, pp. 9419-9425.
- [70] W.M. Guo, Z.G. Yang, and G.J. Zhang, "Microstructural evolution of ZrB2–MoSi2 composites during heat treatment." *Ceramics International*, 2011, v. 37, pp. 2931-2935.
- [71] L. Silvestroni and D. Sciti, "Effects of MoSi₂ additions on the properties of Hf and ZrB₂ composites produced by pressureless sintering." *Scripta Materialia*, 2007, v. 57, pp. 165-168.
- [72] I. Talmy, J. Zaykoski, M. Opeka, and A. Smith, "Properties of ceramics in the system ZrB₂–Ta₅Si₃." *Journal of Materials Research*, 2006, v. 21, pp. 2593-2599.
- [73] H. Hu, Q. Wang, Z. Chen, C. Zhang, Y. Zhang, and J. Wang, "Preparation and characterization of C/SiC–ZrB₂ composites by precursor infiltration and pyrolysis process." *Ceramics International*, 2010, v. 36, pp. 1011-1016.
- [74] G. Zhang, M. Ando, J. Yang, T. Ohji, and S. Kanzaki, "Boron carbide and nitride as reactants for in situ synthesis of boride-containing ceramic composites." *Journal of the European Ceramic Society*, 2004, v. 24, pp. 171-178.

- [75] I.G. Talmy, J.A. Zaykoski, and M.M. Opeka, "High-temperature chemistry and oxidation of ZrB₂ ceramics containing SiC, Si₃N₄, Ta₅Si₃, and TaSi₂." *Journal of the American Ceramic Society*, 2008, v. 91, pp. 2250-2257.
- [76] L. Silvestroni, S. Guicciardi, C. Melandri, and D. Sciti, "TaB₂-based ceramics: microstructure, mechanical properties and oxidation resistance." *Journal of the European Ceramic Society*, 2012, v. 32, pp. 97-105.
- [77] C. Yeh and H. Wang, "A comparative study on combustion synthesis of Ta–B compounds." *Ceramics International*, 2011, v. 37, pp. 1569-1573.
- [78] X. Zhang, G.E. Hilmas, and W.G. Fahrenholtz, "Densification, mechanical properties, and oxidation resistance of TaC–TaB₂ ceramics." *Journal of the American Ceramic Society*, 2008, v. 91, pp. 4129-4132.
- [79] R. Licheri, R. Orrù, C. Musa, and G. Cao, "Synthesis, densification and characterization of TaB₂–SiC composites." *Ceramics International*, 2010, v. 36, pp. 937-941.
- [80] I. Talmy, J. Zaykoski, and M. Opeka, "Synthesis, processing and properties of TaC– TaB₂–C ceramics." *Journal of the European Ceramic Society*, 2010, v. 30, pp. 2253-2263.
- [81] M.M. Opeka, I.G. Talmy, and J. Zaykoski, "Oxidation-based materials selection for 2000 C+ hypersonic aerosurfaces: theoretical considerations and historical experience." *Journal of Materials Science*, 2004, v. 39, pp. 5887-5904.
- [82] C. Liu, L. Cheng, X. Luan, W. Zhang, and C. Wang, "Real-time damage evaluation of a SiC coated carbon/carbon composite under cyclic fatigue at high temperature in an oxidizing atmosphere." *Materials Science and Engineering: A*, 2009, v. 524, pp. 98-101.
- [83] Q.G. Fu, H.J. Li, X.H. Shi, K.Z. Li, and G.D. Sun, "Silicon carbide coating to protect carbon/carbon composites against oxidation." *Scripta Materialia*, 2005, v. 52, pp. 923-927.
- [84] S. Kitaoka, T. Tsuji, T. Katoh, Y. Yamaguchi, and K. Kashiwagi, "Tribological Characteristics of SiC Ceramics in High-Temperature and High-Pressure Water." *Journal of the American Ceramic Society*, 1994, v. 77, pp. 1851-1856.
- [85] C. Zishan, L. Hejun, F. Qiangang, and Q. Xinfa, "Tribological behaviors of SiC/h-BN composite coating at elevated temperatures." *Tribology International*, 2012, v. 56, pp. 58-65.

- [86] B.V.M. Kumar, W.S. Kim, S.H. Hong, H.T. Bae, and D.S. Lim, "Effect of grain size on wear behavior in Y-TZP ceramics." *Materials Science and Engineering: A*, 2010, v. 527, pp. 474-479.
- [87] I.G. Urrutia, S. Zaefferer, and D. Raabe, "The effect of grain size and grain orientation on deformation twinning in a Fe–22 wt.% Mn–0.6 wt.% C TWIP steel." *Materials Science and Engineering: A*, 2010, v. 527, pp. 3552-3560.
- [88] D. Jang and J.R. Greer, "Size-induced weakening and grain boundary-assisted deformation in 60 nm grained Ni nanopillars." *Scripta Materialia*, 2011, v. 64, pp. 77-80.
- [89] Y.R. Jeng, P.C. Tsai, and S.H. Chiang, "Effects of grain size and orientation on mechanical and tribological characterizations of nanocrystalline nickel films." *Wear*, 2013, v. 303, pp. 262-268.
- [90] H.H. Shim, O.K. Kwon, and J.R. Youn, "Effects of fiber orientation and humidity on friction and wear properties of graphite fiber composites." *Wear*, 1992, v. 157, pp. 141-149.
- [91] S. Fouquet, M. Rollin, R. Pailler, and X. Bourrat, "Tribological behaviour of composites made of carbon fibres and ceramic matrix in the Si–C system." *Wear*, 2008, v. 264, pp. 850-856.
- [92] W. Krenkel, B. Heidenreich, and R. Renz, "C/C-SiC composites for advanced friction systems." *Advanced Engineering Materials*, 2002, v. 4, pp. 427-436.
- [93] S. Fan, L. Zhang, Y. Xu, L. Cheng, J. Lou, J. Zhang, et al., "Microstructure and properties of 3D needle-punched carbon/silicon carbide brake materials." *Composites Science and Technology*, 2007, v. 67, pp. 2390-2398.
- [94] Y. Cai, X. Yin, S. Fan, L. Zhang, L. Cheng, Y. Wang, et al., "Effects of particle sizes and contents of ceramic fillers on tribological behavior of 3D C/C composites." *Ceramics International*, 2014, v. 40, pp. 14029-14037.
- [95] Y. Cai, X. Yin, S. Fan, L. Zhang, and L. Cheng, "Tribological behavior of threedimensional needled ceramic modified carbon/carbon composites in seawater conditions." *Composites Science and Technology*, 2013, v. 87, pp. 50-57.

- [96] Y. Cai, S. Fan, X. Yin, L. Zhang, L. Cheng, and Y. Wang, "Microstructures and mechanical properties of three-dimensional ceramic filler modified carbon/carbon composites." *Ceramics International*, 2014, v. 40, pp. 399-408.
- [97] B. Yen, "An investigation of friction and wear mechanisms of carbon-carbon composites in nitrogen and air at elevated temperatures." *Carbon*, 1996, v. 34, pp. 489-498.
- [98] H. Kasem, S. Bonnamy, B. Rousseau, H.E. Szwarckopf, Y. Berthier, and P. Jacquemard, "Interdependence between wear process, size of detached particles and CO₂ production during carbon/carbon composite friction." *Wear*, 2007, v. 263, pp. 1220-1229.
- [99] M. Gouider, Y. Berthier, P. Jacquemard, B. Rousseau, S. Bonnamy, and H.E. Szwarckopf, "Mass spectrometry during C/C composite friction: carbon oxidation associated with high friction coefficient and high wear rate." *Wear*, 2004, v. 256, pp. 1082-1087.
- [100] Y. Berthier, "Third body reality, consequence and use of the third body to solve a friction and a wear problem," Wear, Materials, Mechanisms and Practice, G. Stachowiack (ed.). Wiley, Hoboken, NJ, USA, 2005, pp- 74-81.
- [101] M. François, J.P. Joly, P. Kapsa, and P. Jacquemard, "A temperature-programmed desorption and oxidation investigation of wear debris from carbon/carbon composite aircraft brakes." *Carbon*, 2007, v. 45, pp. 124-131.
- [102] T.J. Hutton, B. McEnaney, and J.C. Crelling, "Structural studies of wear debris from carbon–carbon composite aircraft brakes." *Carbon*, 1999, v. 37, pp. 907-916.
- [103] B. Rousseau, H.E. Szwarckopf, S. Bonnamy, M. Gouider, Y. Berthier, and P. Jacquemard, "Optical and scanning electron microscopies cross-fertilization : Application to worn carbon/carbon composite surface studies." *Carbon*, 2005, v. 43, pp. 1331-1334.
- [104] A. Samah, D. Paulmier, and M.E. Mansori, "Damage of carbon–carbon composite surfaces under high pressure and shear strain." *Surface and Coatings Technology*, 1999, v. 120-121, pp. 636-640.
- [105] C.P. Ju, J.H. Chern Lin, K.J. Lee, and H.H. Kuo, "Multi-braking tribological behavior of PAN-pitch, PAN-CVI and pitch–resin-CVI carbon–carbon composites." *Materials Chemistry and Physics*, 2000, v. 64, pp. 196-214.

- [106] H. Kasem, S. Bonnamy, Y. Berthier, and P. Jacquemard, "Characterization of surface grooves and scratches induced by friction of C/C composites at low and high temperatures." *Tribology International*, 2010, v. 43, pp. 1951-1959.
- [107] H.H. Kuo, J.H. Chern Lin, and C.P. Ju, "Tribological behavior of fast-carbonized PAN/phenolic-based carbon/carbon composite and method for improving same." *Wear*, 2005, v. 258, pp. 1555-1561.
- [108] Z. Li, P. Xiao, X. Xiong, and B.Y. Huang, "Preparation and tribological properties of C fibre reinforced C/SiC dual matrix composites fabrication by liquid silicon infiltration." *Solid State Sciences*, 2013, v. 16, pp. 6-12.
- [109] W. Krenkel and T. Henke, "Design of high performance CMC brake discs." Key Engineering Materials, 1999, v. 164, pp. 421-424.
- [110] P. Xiao, Z. Li, and X. Xiong, "Microstructure and tribological properties of 3D needlepunched C/C–SiC brake composites." *Solid State Sciences*, 2010, v. 12, pp. 617-623.
- [111] W. Krenkel, "CMC materials for high performance brakes," ISATA Conference on Supercars. Aachen, Germany, 1994, pp- 769-776.
- [112] S. Fan, L. Zhang, Y. Xu, L. Cheng, G. Tian, S. Ke, et al., "Microstructure and tribological properties of advanced carbon/silicon carbide aircraft brake materials." *Composites Science and Technology*, 2008, v. 68, pp. 3002-3009.
- [113] S. Fan, L. Zhang, L. Cheng, J. Zhang, S. Yang, and H. Liu, "Wear mechanisms of the C/SiC brake materials." *Tribology International*, 2011, v. 44, pp. 25-28.
- [114] G. Jiang, J. Yang, Y. Xu, J. Gao, J. Zhang, L. Zhang, et al., "Effect of graphitization on microstructure and tribological properties of C/SiC composites prepared by reactive melt infiltration." *Composites Science and Technology*, 2008, v. 68, pp. 2468-2473.
- [115] Y. Xu, Y. Zhang, L. Cheng, L. Zhang, J. Lou, and J. Zhang, "Preparation and friction behavior of carbon fiber reinforced silicon carbide matrix composites." *Ceramics International*, 2007, v. 33, pp. 439-445.
- [116] Y. Zhang, Z. Xiao, J. Wang, J. Yang, and Z. Jin, "Effect of pyrocarbon content in C/C preforms on microstructure and mechanical properties of the C/C–SiC composites." *Materials Science and Engineering: A*, 2009, v. 502, pp. 64-69.

- [117] W. Krenkel and H. Hald, "Liquid Infiltrated C/SiC--an Alternative Material for Hot Space Structures." Spacecraft Structures and Mechanical Testing, 1989, v. 1, pp. 325-330.
- [118] W. Krenkel and F. Berndt, "C/C–SiC composites for space applications and advanced friction systems." *Materials Science and Engineering: A*, 2005, v. 412, pp. 177-181.
- [119] J.S. Fischedick, M. Frieß, W. Krenkel, R. Kochendörfer, and M. König, "Crack Microstructure During the Carbonization of Carbon Fibre Reinforced Plastics to Carbon/Carbon Composites," 12th International Conference on Composite Materials (ICCM-12), Paris, France, 1999, pp. 5-7.
- [120] W. Krenkel, "Designing with C/C-SiC Composites," Advances in Ceramic Matrix Composites, N. P. Bansal, J. P. Singh, W. M. Kriven, and H. Schneider (eds.). Wiley, Hoboken, NJ, USA, 2006, pp. 103-123.
- [121] W. Krenkel, "Design of Ceramic Brake Pads and Disks," 26th Annual Conference on Composites, Advanced Ceramics, Materials, and Structures-A, Florida, USA, 2002, pp. 319-324.
- [122] A. Fillion, "Composites C/C et C/C-SiC pour applications tribologiques," Ph.D thesis, Université de Bordeaux, Cedex, France, 2000.
- [123] N.P. Bansal, Handbook of ceramic composites, Springer Science & Business Media, Berlin, Germany, 2006.
- [124] Q. Shi and P. Xiao, "Effect of pyrolytic carbon content on microstructure and tribological properties of C/C–SiC brake composites fabricated by isothermal chemical vapor infiltration." *Solid State Sciences*, 2012, v. 14, pp. 26-34.
- [125] J.X. Zhang, S.W. Fan, L.T. Zhang, L.F. Cheng, S.J. Yang, and G.L. Tian, "Microstructure and frictional properties of 3D needled C/SiC brake materials modified with graphite." *Transactions of Nonferrous Metals Society of China*, 2010, v. 20, pp. 2289-2293.
- [126] P. Xiao, X. Xiong, H.B. Zhang, and B.Y. Huang, "Progress and application of C/C-SiC ceramic braking materials." *Chinese Journal of Nonferrous Metals*, 2005, v. 15, pp. 667.
- [127] X. Zhou, D. Zhu, Q. Xie, F. Luo, and W. Zhou, "Friction and wear properties of C/C– SiC braking composites." *Ceramics International*, 2012, v. 38, pp. 2467-2473.

- [128] P. Xiao, X. Xiong, and Y.Y. Ren, "Effect and mechanism of different components of C/C-SiC composites on friction and wear behaviors." *Chinese Journal of Nonferrous Metals* 2005, v. 15, pp. 1040.
- [129] Y.N. Zhang, Y.D. Xu, J.J. Lou, L.T. Zhang, L.F. Cheng, and Z.J. Chen, "Analysis of friction and wear performance of C/C-SiC composites." *Journal of Aeronautical Materials*, 2005, v. 25, pp. 49-54.
- [130] G.W. Stachowiak and A.W. Batchelor, Engineering Tribology, Elsevier, Amsterdam, Netherlands, UK, 2001.
- [131] Z. Li, P. Xiao, X. Xiong, and S.H. Zhu, "Tribological characteristics of C/C-SiC braking composites under dry and wet conditions." *Transactions of Nonferrous Metals Society of China*, 2008, v. 18, pp. 1071-1075.
- [132] P. Andersson, "Water-lubricated pin-on-disc tests with ceramics." Wear, 1992, v. 154, pp. 37-47.
- [133] J.K. Lancaster, "A review of the influence of environmental humidity and water on friction, lubrication and wear." *Tribology International*, 1990, v. 23, pp. 371-389.
- [134] K.H.Z. Gahr, "Sliding wear of ceramic-ceramic, ceramic-steel and steel-steel pairs in lubricated and unlubricated contact." *Wear*, 1989, v. 133, pp. 1-22.
- [135] S.S. Tzeng and Y.G. Chr, "Evolution of microstructure and properties of phenolic resin-based carbon/carbon composites during pyrolysis." *Materials Chemistry and Physics*, 2002, v. 73, pp. 162-169.
- [136] J.Y. Paris, L. Vincent, and J. Denape, "High-speed tribological behaviour of a carbon/silicon-carbide composite." *Composites Science and Technology*, 2001, v. 61, pp. 417-423.
- [137] Z. Q. Li, C. J. Lu, Z. P. Xia, Y. Zhou, and Z. Luo, "X-ray diffraction patterns of graphite and turbostratic carbon." *Carbon*, 2007, v. 45, pp. 1686-1695.
- [138] M. Kermc, M. Kalin, and J. Vižintin, "Development and use of an apparatus for tribological evaluation of ceramic-based brake materials." *Wear*, 2005, v. 259, pp. 1079-1087.
- [139] Y. Zhou, K. Hirao, Y. Yamauchi, and S. Kanzaki, "Tribological Properties of Silicon Carbide and Silicon Carbide–Graphite Composite Ceramics in Sliding Contact." *Journal* of the American Ceramic Society, 2003, v. 86, pp. 991-1002.

- [140] T.E. Fischer, Z. Zhu, H. Kim, and D. S. Shin, "Genesis and role of wear debris in sliding wear of ceramics." *Wear*, 2000, v. 245, pp. 53-60.
- [141] J. Takadoum, Z. Zsiga, and C.R. Carmes, "Wear mechanism of silicon carbide: new observations." Wear, 1994, v. 174, pp. 239-242.
- [142] B.K. Yen, "Influence of water vapor and oxygen on the tribology of carbon materials with sp² valence configuration." *Wear*, 1996, v. 192, pp. 208-215.
- [143] C. Blanco, J. Bermejo, H. Marsh, and R. Menendez, "Chemical and physical properties of carbon as related to brake performance." *Wear*, 1997, v. 213, pp. 1-12.
- [144] C. Byrne and Z. Wang, "Influence of thermal properties on friction performance of carbon composites." *Carbon*, 2001, v. 39, pp. 1789-1801.
- [145] A. Mühlratzer and M. Leuchs, "Applications of Non-Oxide CMCs," High Temperature Ceramic Matrix Composites, W. Krenkel, R. Naslain, and H. Schneider (eds.), Wiley Online Library, Hoboken, NJ, USA, 2001, pp. 288-298.
- [146] S. Vaidyaraman, M. Purdy, T. Walker, and S. Horst, "C/SiC Material Evaluation for Aircraft Brake Applications," High Temperature Ceramic Matrix Composites, W. Krenkel, R. Naslain, H. Schneider(eds.), Wiley Online Library, Hoboken, NJ, USA, 2001, pp. 802-808.
- [147] S. Seghi, B. Fabio, and J. Economy, "Carbon/carbon-boron nitride composites with improved wear resistance compared to carbon/carbon." *Carbon*, 2004, v. 42, pp. 3043-3048.
- [148] S. Seghi, J. Lee, and J. Economy, "High density carbon fiber/boron nitride matrix composites: Fabrication of composites with exceptional wear resistance." *Carbon*, 2005, v. 43, pp. 2035-2043.
- [149] Y. Cai, S. Fan, H. Liu, L. Zhang, L. Cheng, B. Dong, et al., "Microstructures and improved wear resistance of 3D needled C/SiC composites with graphite filler." *Composites Science and Technology*, 2009, v. 69, pp. 2447-2453.
- [150] Y. Cai, S. Fan, X. Yin, L. Zhang, L. Cheng, J. Jiang, et al., "Effects of Graphitization Degree in Three-Dimensional Needled C/SiC Composites on Tribological Properties." *International Journal of Applied Ceramic Technology*, 2011, v. 8, pp. 317-328.

- [151] X. Xu, S. Fan, L. Zhang, Y. Du, and L. Cheng, "Tribological behavior of threedimensional needled carbon/silicon carbide and carbon/carbon brake pair." *Tribology International*, 2014, v. 77, pp. 7-14.
- [152] Y. Cai, Y. Xu, B. Li, S. Fan, L. Zhang, L. Cheng, et al., "Low-cost preparation and frictional behaviour of a three-dimensional needled carbon/silicon carbide composite." *Journal of the European Ceramic Society*, 2009, v. 29, pp. 497-503.
- [153] U. Nirmal, B.F. Yousif, D. Rilling, and P.V. Brevern, "Effect of betelnut fibres treatment and contact conditions on adhesive wear and frictional performance of polyester composites." *Wear*, 2010, v. 268, pp. 1354-1370.
- [154] K. Friedrich, K. Váradi, T. Goda, and H. Giertzsch, "Finite Element Analysis of a Polymer Composite Subjected to a Sliding Steel Asperity: Part II: Parallel and Anti-Parallel Fibre Orientations." *Journal of Materials Science*, 2002, v. 37, pp. 3497-3507.
- [155] O. Smerdova, J.C. Barrioz, A.L. Bot, and B. Sarbaev, "Analytical Model and Experimental Validation of Friction Laws for Composites Under Low Loads." *Tribology Letters*, 2012, v. 46, pp. 263-272.
- [156] B. Lei, L. He, M. Yi, L. Ran, H. Xu, Y. Ge, et al., "New insights into the microstructure of the friction surface layer of C/C composites." *Carbon*, 2011, v. 49, pp. 4554-4562.
- [157] J.M. Su, Z.C. Xiao, Y.Q. Liu, F.C. Meng, Z.G. Peng, L.M. Gu, et al., "Preparation and characterization of carbon/carbon aircraft brake materials with long service life and good frictional properties." *New Carbon Materials*, 2010, v. 25, pp. 329-334.
- [158] H. Wang, D. Zhu, F. Wan, W. Zhou, and F. Luo, "Influence of the C/C preform density on tribological characteristics of C/C–SiC composites under different conditions." *Ceramics International*, 2014, v. 40, pp. 16641-16646.
- [159] C. Xiang, M. Li, M. Zhi, A. Manivannan, and N. Wu, "A reduced graphene oxide/Co3O4 composite for supercapacitor electrode." *Journal of Power Sources*, 2013, v. 226, pp. 65-70.
- [160] T. Policandriotes and P. Filip, "Effects of selected nanoadditives on the friction and wear performance of carbon–carbon aircraft brake composites." *Wear*, 2011, v. 271, pp. 2280-2289.

- [161] J.R. Gomes, O.M. Silva, C.M. Silva, L.C. Pardini, and R.F. Silva, "The effect of sliding speed and temperature on the tribological behaviour of carbon–carbon composites." *Wear*, 2001, v. 249, pp. 240-245.
- [162] V.K. Srivastava, "Sliding Behavior of C/C and C/C-SiC Composites in Acidic Environment-Against High Chromium Steel Disc." *American Journal of Materials Science*, 2011, v. 1, pp. 103-107.
- [163] H. Dhieb, J.G. Buijnsters, F. Eddoumy, and J.P. Celis, "Surface damage of unidirectional carbon fiber reinforced epoxy composites under reciprocating sliding in ambient air." *Composites Science and Technology*, 2011, v. 71, pp. 1769-1776.
- [164] B. Cao, S. Gao, Z. Yao, J. Chen, F. Chen, and H.J. Chen, "Tribological Behavior of Polytetrafluoroethylene under Unidirectional Rotation, Reciprocating Sliding, and Torsion Motion." *Tribology Transactions*, 2017, v. 60, pp. 605-614.
- [165] E. Marui and H. Endo, "Effect of reciprocating and unidirectional sliding motion on the friction and wear of copper on steel." *Wear*, 2001, v. 249, pp. 582-591.
- [166] J. Andersson, A. Almqvist, and R. Larsson, "Numerical simulation of a wear experiment." *Wear*, 2011, v. 271, pp. 2947-2952.
- [167] H.S. Benabdallah, "Reciprocating sliding friction and contact stress of some thermoplastics against steel." *Journal of Materials Science*, 1997, v. 32, pp. 5069-5083.
- [168] S. Ozcan, P. Filip, "Wear of carbon fiber reinforced carbon matrix composites: Study of abrasive, oxidative wear and influence of humidity." *Carbon*, 2013, v. 62, pp. 240-247.
- [169] J. Korab, G. Korb, and P. Sebo, "Thermal expansion and thermal conductivity of continuous carbon fibre reinforced copper matrix composites," Electronics Manufacturing Technology Symposium, Berlin, Germany, 1998, pp. 104-108.
- [170] H. Deng, K. Li, H. Li, P. Wang, J. Xie, and L. Zhang, "Effect of brake pressure and brake speed on the tribological properties of carbon/carbon composites with different pyrocarbon textures." *Wear*, 2010, v. 270, pp. 95-103.
- [171] J.D. Chen, J.H.C. Lin, and C.P. Ju, "Effect of humidity on the tribological behavior of carbon-carbon composites." *Wear*, 1996, v. 193, pp. 38-47.

- [172] P. Kumar and V.K. Srivastava, "A Review on Wear and Friction Performance of Carbon–Carbon Composites at High Temperature." *International Journal of Applied Ceramic Technology*, 2016, v. 13, pp. 702-710.
- [173] B.K. Yen, T. Ishihara, and I. Yamamoto, "Influence of environment and temperature on "dusting" wear transitions of carbon–carbon composites." *Journal of Materials Science*, 1997, v. 32, pp. 681-686.
- [174] S. Fan, C. Yang, L. He, J. Deng, L. Zhang, and L. Cheng, "The effects of phosphate coating on friction performance of C/C and C/SiC brake materials." *Tribology International*, 2017, v. 114, pp. 337-348.
- [175] Y. Bi, R. Luo, J. Li, Z. Feng, and Z. Jin, "The effects of the hydraulic oil on mechanical and tribological properties of C/C composites." *Materials Science and Engineering: A*, 2008, v. 483, pp. 274-276.
- [176] Q.J. Xue, Z.Z. Zhang, W.M. Liu, and W.C. Shen, "Friction and wear characteristics of fiber- and whisker-reinforced PTFE composites under oil lubricated conditions." *Journal* of Applied Polymer Science, 1998, v. 69, pp. 1393-1402.
- [177] J.D. Chen and C.P. Ju, "Effect of sliding speed on the tribological behavior of a PANpitch carbon-carbon composite." *Materials Chemistry and Physics*, 1995, v. 39, pp. 174-179.
- [178] P. Kumar and V.K. Srivastava, "Reciprocating sliding tribology of ceramic fiber composites with variation of laminate orientation and surface conformity." *Ceramics International*, 2018, v. 44, pp. 5365-5370.
- [179] S. Yu, F. Zhang, X. Xiong, Y. Li, N. Tang, Y. Koizumi, et al., "Tribological properties of carbon/carbon composites with various pyrolytic carbon microstructures." *Wear*, 2013, v. 304, pp. 103-108.
- [180] V.K. Srivastava, "Wear Behaviour of C/C–SiC Composites Sliding against High-Cr Steel Discs." Zeitschrift für Metallkunde, 2003, v. 94, pp. 458-462.
- [181] J.L.S. Sergio Fernández-González, E.Gascón, L. López, E. García-Ortega, and A. Merino, "Weather Features Associated with Aircraft Icing Conditions: A Case Study." *The Scientific World Journal*, 2014, v. 201, pp. 1-18.
- [182] M.G. Potapczuk, "Aircraft Icing Research at NASA Glenn Research Center." Journal of Aerospace Engineering, 2013, v. 26, pp. 260-276.

- [183] M.J. Oliver, "Validation Ice Crystal Icing Engine Test in the Propulsion Systems Laboratory at NASA Glenn Research Center," 6th AIAA Atmospheric and Space Environments Conference, Atlanta, USA, 2014, pp. 1-34.
- [184] A. Leatherbarrow and H. Wu, "Mechanical behaviour of the constituents inside carbon-fibre/carbon-silicon carbide composites characterised by nano-indentation." *Journal of the European Ceramic Society*, 2012, v. 32, pp. 579-588.
- [185] D.M. Mulvihill, O. Smerdova, and M. P. F. Sutcliffe, "Friction of carbon fibre tows." *Composites Part A: Applied Science and Manufacturing*, 2017, v. 93, pp. 185-198.
- [186] M. Grujicic, C.L. Zhao, E.C. Dusel, D.R. Morgan, R.S. Miller, and D.E. Beasley, "Computational analysis of the thermal conductivity of the carbon–carbon composite materials." *Journal of Materials Science*, 2006, v. 41, pp. 8244-8256.
- [187] N.E. Tayeb and I. Mostafa, "The effect of laminate orientations on friction and wear mechanisms of glass reinforced polyester composite." *Wear*, 1996, v. 195, pp. 186-191.
- [188] A.A.E. Sayed, M.G.E. Sherbiny, A.S. Abo-El-Ezz, and G.A. Aggag, "Friction and wear properties of polymeric composite materials for bearing applications." *Wear*, 1995, v. 184, pp. 45-53.
- [189] J.K. Lancaster, "The effect of carbon fibre reinforcement on the friction and wear of polymers." *Journal of Physics D: Applied Physics*, 1968, v. 1, pp. 549-559.
- [190] Y. Sahin and S. Murphy, "The effect of fibre orientation of the dry sliding wear of borsic-reinforced 2014 aluminium alloy." *Journal of Materials Science*, 1996, v. 31, pp. 5399-5407.
- [191] X. Qu, L. Zhang, H. Ding, and G. Liu, "The effect of steel fiber orientation on frictional properties of asbestos-free friction materials." *Polymer Composites*, 2004, v. 25, pp. 94-101.
- [192] J.P. Giltrow and J.K. Lancaster, "The role of the counterface in the friction and wear of carbon fibre reinforced thermosetting resins." *Wear*, 1970, v. 16, pp. 359-374.
- [193] Y.K. Chen, O.P. Modi, A.S. Mhay, A. Chrysanthou, and J.M. O'Sullivan, "The effect of different metallic counterface materials and different surface treatments on the wear and friction of polyamide 66 and its composite in rolling–sliding contact." *Wear*, 2003, v. 255, pp. 714-721.

- [194] J. Schön, "Coefficient of friction and wear of a carbon fiber epoxy matrix composite." Wear, 2004, v. 257, pp. 395-407.
- [195] Y. Tang, H. Liu, H. Zhao, L. Liu, and Y. Wu, "Friction and wear properties of copper matrix composites reinforced with short carbon fibers." *Materials & Design*, 2008, v. 29, pp. 257-261.
- [196] X. Jincheng, Y. Hui, X. long, L. Xiaolong, and Y. Hua, "Effects of some factors on the tribological properties of the short carbon fiber-reinforced copper composite." *Materials* & Design, 2004, v. 25, pp. 489-493.
- [197] I. Roselman and D. Tabor, "The friction and wear of individual carbon fibres." *Journal* of *Physics D: Applied Physics*, 1977, v. 10, pp. 1181.
- [198] C.F. Tu and T. Fort, "A study of fiber–capstan friction. 1. Stribeck curves." *Tribology International*, 2004, v. 37, pp. 701-710.
- [199] O. Smerdova, "Interfacial and bulk friction-inducted dissipation in composites," Ph.D Thesis, Ecole Centrale de Lyon, Écully, France, 2012.
- [200] H.G. Lee, H.Y. Hwang, and D.G. Lee, "Effect of wear debris on the tribological characteristics of carbon fiber epoxy composites." *Wear*, 2006, v. 261, pp. 453-459.
- [201] T. Tsukizoe and N. Ohmae, "Friction and Wear Performance of Unidirectionally Oriented Glass, Carbon, Aramid and Stainless Steel Fiber-Reinforced Plastics," Composite Materials Series, K. Friedrich (ed.), Elsevier, Amsterdam, Netherlands, UK, 1986, pp. 205-231.