

BIBLIOGRAPHY

- [1] ASTM INTERNATIONAL, "ASTM F2792-12a," *Rapid Manuf. Assoc.*, pp. 13, 2013, doi: 10.1520/F2792-12A.2.
- [2] P. Kocovic, *3D Printing and Its Impact on the Production of Fully Functional Components*. 2017. doi: 10.4018/978-1-5225-2289-8.
- [3] K. Narsimlu, A. G. Pathak, A. G. Mulky and C. Yavarna, "A Market Analysis on impact of additive layer manufacturing technologies on aerospace and defense supply chain," *Int. J. Manag.*, vol. 8, no. 2, pp. 171–187, 2017.
- [4] D. M. J. Cotteleer, "3D opportunity: Additive manufacturing paths to performance, innovation, and growth," *LLP Online*, 2014, [Online]. Available: http://cellular3d.com/images/marketresearch/SIMT_AM_Conference_Keynote-Oct2014.pdf
- [5] M. Stocker and J. Mitchell, "From rapid prototyping to rapid manufacturing," *Auto Technol.*, vol. 2, pp. 38–39, 2002.
- [6] R. I. Noorani, *Rapid prototyping: principles and applications*. Wiley, 2005.
- [7] N. Hopkinson, R. J. M. Hague and P. M. Dickens, *Rapid Manufacturing: An Industrial Revolution for the Digital Age*. 2006. doi: 10.1002/0470033991.ch9.
- [8] Wohlers Associates, *Wohlers Report*. 2019.
- [9] M. Bhuvanesh Kumar and P. Sathiya, "Methods and materials for additive manufacturing: A critical review on advancements and challenges," *Thin-Walled Struct.*, vol. 159, no. October 2020, p. 107228, 2021, doi: 10.1016/j.tws.2020.107228.
- [10] C. de Vries, "Volkswagen Autoeuropa: Maximizing Production Efficiency with 3D Printed Tools and Fixtures," *Ultim. B.V.*, 2017.
- [11] S. van de Staak, "Royal Netherlands Air Force: Speeding up maintenance with 3D printed tools," 2018.
- [12] S. Publishing, *Additive Manufacturing Opportunities In Automotive*. 2018.

- [13] B. Redwood, F. Schoffer and B. Garret, *The 3D Printing Handbook*. 2017.
- [14] Dassault Sytemes, "Introduction to 3D printing - additive processes." <https://make.3dexperience.3ds.com/processes/3D-printing>
- [15] J. R. C. Dizon, A. H. Espera, Q. Chen and R. C. Advincula, "Mechanical characterization of 3D-printed polymers," *Addit. Manuf.*, vol. 20, pp. 4467, 2018, doi: 10.1016/j.addma.2017.12.002.
- [16] K. Deshmukh, A. Muzaffar, T. Kovářík, T. Krenek, M. B. Ahamed and S. K. K. Pasha, *Fundamentals and applications of 3D and 4D printing of polymers: Challenges in polymer processing and prospects of future research*. 2019. doi: 10.1016/B978-0-12-816805-9.00017-X.
- [17] P. Dudek and A. Rapacz-Kmita, "Rapid prototyping: Technologies, materials and advances," *Arch. Metall. Mater.*, vol. 61, no. 2A, pp. 891895, 2016, doi: 10.1515/amm-2016-0151.
- [18] S. Yuan, F. Shen, C. K. Chua and K. Zhou, "Polymeric composites for powder-based additive manufacturing: Materials and applications," *Prog. Polym. Sci.*, vol. 91, pp. 141–168, 2019, doi: 10.1016/j.progpolymsci.2018.11.001.
- [19] M. Schmid, A. Amado and K. Wegener, "Polymer powders for selective laser sintering (SLS)," *AIP Conf. Proc.*, vol. 1664, no. 2015, 2015, doi: 10.1063/1.4918516.
- [20] D. Bourell et al., "Materials for additive manufacturing," *CIRP Ann. - Manuf. Technol.*, vol. 66, no. 2, pp. 659–681, 2017, doi: 10.1016/j.cirp.2017.05.009.
- [21] K. Dotchev and W. Yusoff, "Recycling of polyamide 12 based powders in the laser sintering process," *Rapid Prototyp. J.*, vol. 15, no. 3, pp. 192203, May 2009, doi: 10.1108/13552540910960299.
- [22] D. Drummer, D. Rietzel and F. Kühnlein, "Development of a characterization approach for the sintering behavior of new thermoplastics for selective laser sintering," *Phys. Procedia*, vol. 5, no. PART 2, pp. 533–542, 2010, doi: 10.1016/j.phpro.2010.08.081.
- [23] S. C. Ligon, R. Liska, J. Stampfl, M. Gurr and R. Mülhaupt, "Polymers for 3D Printing and Customized Additive Manufacturing," *Chem. Rev.*, vol. 117, no. 15, pp. 10212–10290, 2017, doi: 10.1021/acs.chemrev.7b00074.

- [24] R. D. Goodridge, C. J. Tuck and R. J. M. Hague, "Laser sintering of polyamides and other polymers," *Prog. Mater. Sci.*, vol. 57, no. 2, pp. 229–267, 2012, doi: 10.1016/j.pmatsci.2011.04.001.
- [25] K. S. R. Chandran, "Mechanical fatigue of polymers: A new approach to characterize the S-N behavior on the basis of macroscopic crack growth mechanism," *Polymer (Guilaf)*, vol. 91, pp. 222–238, 2016, doi: 10.1016/j.polymer.2016.03.058.
- [26] M. A. Castillo Acero, F. M. de la Escalera and Y. Essa, "Morphing Technology for Advanced Future Commercial Aircrafts," in *Morphing Wing Technologies*, A. Concilio, I. Dimino, L. Lecce and R. Pecora, Eds. Butterworth-Heinemann, 2018, pp. 585–618.
- [27] J. Cheng, S. Lao, K. Nguyen, W. Ho, A. Cummings and J. Koo, "SLS processing studies of nylon 11 nanocomposites," *16th Solid Free. Fabr. Symp. SFF2005*, no. January 2005, pp. 141–149, 2005.
- [28] EOS, "Datasheet PA 2200." 2018.
- [29] 3D Systems, "DuraForm PA." 2017. [Online]. Available: https://es.3dsystems.com/sites/default/files/2017-03/3D-Systems_DuraForm_PA_DATASHEET_USEN_2017.03.22_a_WEB.pdf
- [30] B. Van Hooreweder, D. Moens, R. Boonen, J. P. Kruth and P. Sas, "On the difference in material structure and fatigue properties of nylon specimens produced by injection molding and selective laser sintering," *Polym. Test.*, vol. 32, no. 5, pp. 972–981, 2013, doi: 10.1016/j.polymertesting.2013.04.014.
- [31] R. Seltzer, F. M. de la Escalera and J. Segurado, "Effect of water conditioning on the fracture behavior of PA12 composites processed by selective laser sintering," *Mater. Sci. Eng. A*, vol. 528, no. 22–23, pp. 6927–6933, 2011, doi: 10.1016/j.msea.2011.05.045.
- [32] R. D. Goodridge, R. J. M. Hague and C. J. Tuck, "Effect of long-term ageing on the tensile properties of a polyamide 12 laser sintering material," *Polym. Test.*, vol. 29, no. 4, pp. 483–493, 2010, doi: 10.1016/j.polymertesting.2010.02.009.
- [33] B. Caulfield, P. E. McHugh and S. Lohfeld, "Dependence of mechanical properties of polyamide components on build parameters in the SLS process," *J. Mater. Process. Technol.*, vol. 182, no. 1–3, pp. 477–488, 2007, doi: 10.1016/j.jmatprotec.2006.09.007.

- [34] T. Stichel *et al.*, "A Round Robin study for Selective Laser Sintering of polyamide 12: Microstructural origin of the mechanical properties," *Opt. Laser Technol.*, vol. 89, no. July 2016, pp. 31–40, 2017, doi: 10.1016/j.optlastec.2016.09.042.
- [35] T. L. Starr, T. J. Gornet and J. S. Usher, "The effect of process conditions on mechanical properties of laser-sintered nylon," *Rapid Prototyp. J.*, vol. 17, no. 6, pp. 418–423, 2011, doi: 10.1108/13552541111184143.
- [36] N. Lammens, M. Kersemans, I. De Baere and W. Van Paepegem, "On the visco-elasto-plastic response of additively manufactured polyamide-12 (PA-12) through selective laser sintering," *Polym. Test.*, vol. 57, pp. 149–155, 2017, doi: 10.1016/j.polymertesting.2016.11.032.
- [37] S. Dupin, O. Lame, C. Barres and J. Y. Charneau, "Microstructural origin of physical and mechanical properties of polyamide 12 processed by laser sintering," *Eur. Polym. J.*, vol. 48, no. 9, pp. 1611–1621, 2012, doi: 10.1016/j.eurpolymj.2012.06.007.
- [38] D. J. Hitt, B. Haworth and N. Hopkinson, "Fracture mechanics approach to compare laser sintered parts and injection mouldings of nylon-12," *Proc. Inst. Mech. Eng. Part B J. Eng. Manuf.*, vol. 225, no. 9, pp. 16631672, 2011, doi: 10.1177/0954405411402141.
- [39] A. Salazar, A. Rico, J. Rodríguez, J. Segurado Escudero, R. Seltzer and F. Martin De La Escalera Cutillas, "Fatigue crack growth of SLS polyamide 12: Effect of reinforcement and temperature," *Compos. Part B Eng.*, vol. 59, pp. 285–292, 2014, doi: 10.1016/j.compositesb.2013.12.017.
- [40] A. Salazar, A. Rico, J. Rodríguez, J. Segurado Escudero, R. Seltzer and F. Martin De La Escalera Cutillas, "Monotonic loading and fatigue response of a bio-based polyamide PA11 and a petrol-based polyamide PA12 manufactured by selective laser sintering," *Eur. Polym. J.*, vol. 59, pp. 36–45, 2014, doi: 10.1016/j.eurpolymj.2014.07.016.
- [41] T. Brugo, R. Palazzetti, S. Ciric-Kostic, X. T. Yan, G. Minak and A. Zucchelli, "Fracture mechanics of laser sintered cracked polyamide for a new method to induce cracks by additive manufacturing," *Polym. Test.*, vol. 50, pp. 301–308, 2016, doi: 10.1016/j.polymertesting.2016.01.024.
- [42] A. Salazar, J. Rodríguez, A. Segovia and A. B. Martínez, "Influence of the notch sharpening technique on the fracture toughness of bulk ethylenepropylene block copolymers," *Polym. Test.*, vol. 29, no. 1, pp. 49–59, 2010, doi: 10.1016/j.polymertesting.2009.09.004.

- [43] A. B. Martínez, A. Salazar, N. León, S. Illescas and J. Rodríguez, "Influence of the notch-sharpening technique on styrene-acrylonitrile fracture behavior," *J. Appl. Polym. Sci.*, vol. 133, no. 32, pp. 1–14, Aug. 2016, doi: 10.1002/app.43775.
- [44] M. Crespo, M. T. Gómez-del Río and J. Rodríguez, "Failure of SLS polyamide 12 notched samples at high loading rates," *Theor. Appl. Fract. Mech.*, vol. 92, pp. 233–239, Dec. 2017, doi: 10.1016/j.tafmec.2017.08.008.
- [45] M. Crespo, T. Gómez-del Río and J. Rodríguez, "Failure of polyamide 12 notched samples manufactured by selective laser sintering," *J. Strain Anal. Eng. Des.*, vol. 54, no. 3, pp. 192–198, Apr. 2019, doi: 10.1177/0309324719847817.
- [46] E. Linul, L. Marsavina and D. I. Stoia, "Mode I and II fracture toughness investigation of Laser-Sintered Polyamide," *Theor. Appl. Fract. Mech.*, vol. 106, no. December 2019, p. 102497, 2020, doi: 10.1016/j.tafmec.2020.102497.
- [47] J. Schneider and S. Kumar, "Multiscale characterization and constitutive parameters identification of polyamide (PA12) processed via selective laser sintering," *Polym. Test.*, vol. 86, no. December 2019, p. 106357, 2020, doi: 10.1016/j.polymertesting.2020.106357.
- [48] D. I. Stoia, L. Marşavina and E. Linul, "Correlations between Process Parameters and Outcome Properties of Laser-Sintered Polyamide," *Polymers (Basel)*, vol. 11, no. 11, p. 1850, Nov. 2019, doi: 10.3390/polym11111850.
- [49] J. A. Hertzberg, R.W., Manson, *Fatigue of Engineering Plastics*. New York: Academic Press, New York, 1980.
- [50] M. T. Takemori, "Polymer Fatigue.," *Annu. Rev. Mater. Sci.*, vol. 14, pp. 171–204, 1984, doi: 10.1146/annurev.ms.14.080184.001131.
- [51] J. A. Sauer and G. C. Richardson, "Fatigue of polymers," *Int. J. Fract.*, vol. 16, no. 6, pp. 499–532, Dec. 1980, doi: 10.1007/BF02265215.
- [52] R. I. Stephens, A. Fatemi, R. R. Stephens and H. O. Fuchs, *Metal Fatigue in Engineering*. 2000.
- [53] R. W. Hertzberg, R. P. Vinci and J. L. Hertzberg, *Deformation and Fracture Mechanics of Engineering Materials*, 5th Editio. 2012.

- [54] R. J. Crawford and P. P. Benham, "Cyclic stress fatigue and thermal softening failure of a thermoplastic," *J. Mater. Sci.*, vol. 9, no. 1, pp. 1828, Jan. 1974, doi: 10.1007/BF00554752.
- [55] D. Hülsbusch, A. Kohl, P. Striemann, M. Niedermeier, J. Strauch and F. Walther, "Development of an energy-based approach for optimized frequency selection for fatigue testing on polymers - Exemplified on polyamide 6," *Polym. Test.*, vol. 81, p. 106260, Jan. 2020, doi: 10.1016/j.polymertesting.2019.106260.
- [56] V. Hirschberg, M. Wilhelm and D. Rodrigue, "Combining mechanical and thermal surface fourier transform analysis to follow the dynamic fatigue behavior of polymers," *Polym. Test.*, vol. 96, p. 107070, Apr. 2021, doi: 10.1016/j.polymertesting.2021.107070.
- [57] J. D. Ferry, *Viscoelastic Properties of Polymers*, 3rd Editio. 1980.
- [58] M. N. Riddell, G. P. Koo and J. L. O'Toole, "Fatigue mechanisms of thermoplastics," *Polym. Eng. Sci.*, vol. 6, no. 4, pp. 363–368, Oct. 1966, doi: 10.1002/pen.760060414.
- [59] J. A. Sauer, E. Foden and D. R. Morrow, "Influence of molecular weight on fatigue behavior of polyethylene and polystyrene," *Polym. Eng. Sci.*, vol. 17, no. 4, pp. 246–250, Apr. 1977, doi: 10.1002/pen.760170407.
- [60] M. Eftekhari and A. Fatemi, "On the strengthening effect of increasing cycling frequency on fatigue behavior of some polymers and their composites: Experiments and modeling," *Int. J. Fatigue*, vol. 87, pp. 153166, 2016, doi: 10.1016/j.ijfatigue.2016.01.014.
- [61] J. A. Sauer and C. C. Chen, "Crazing and fatigue behavior in one- and two-phase glassy polymers," in *Crazing in Polymers*, Berlin/Heidelberg: Springer-Verlag, 1983, pp. 169–224. doi: 10.1007/BFb0024058.
- [62] M. D. Skibo, R. W. Hertzberg and J. A. Manson, "Fatigue fracture processes in polystyrene," *J. Mater. Sci.*, vol. 11, no. 3, pp. 479–490, Mar. 1976, doi: 10.1007/BF00540929.
- [63] S. Arad, J. C. Radon and L. E. Culver, "Fatigue Crack Propagation in Polymethylmethacrylate; the Effect of Loading Frequency," *J. Mech. Eng. Sci.*, vol. 14, no. 5, pp. 328–334, Oct. 1972, doi: 10.1243/JMES_JOUR_1972_014_040_02.

- [64] R. W. Hertzberg, J. A. Manson and M. Skibo, "Frequency sensitivity of fatigue processes in polymeric solids," *Polym. Eng. Sci.*, vol. 15, no. 4, pp. 252–260, Apr. 1975, doi: 10.1002/pen.760150404.
- [65] R. W. Hertzberg, M. D. Skibo, J. A. Manson and J. K. Donald, "Comments on 'A model of fatigue crack growth in polymers,'" *J. Mater. Sci.*, vol. 14, no. 7, pp. 1754–1759, Jul. 1979, doi: 10.1007/BF00569299.
- [66] J. M. Schultz, "Fatigue behaviour of engineering polymers," *Treatise Mater. Sci. Technol.*, vol. 10, no. B, pp. 599–636, 1977.
- [67] A. K. Shojaei and A. R. Wedgewood, "An anisotropic cyclic plasticity, creep and fatigue predictive tool for unfilled polymers," *Mech. Mater.*, vol. 106, pp. 20–34, Mar. 2017, doi: 10.1016/j.mechmat.2017.01.003.
- [68] M. T. Takemori, "Shear and craze competition in subcritical fatigue crack growth: Fatigue lifetime inversions," *Polym. Eng. Sci.*, vol. 27, no. 1, pp. 46–54, Jan. 1987, doi: 10.1002/pen.760270108.
- [69] J. L. Weaver and C. L. Beatty, "The effect of temperature on compressive fatigue of polystyrene," *Polym. Eng. Sci.*, vol. 18, pp. 1117–1126, 1978.
- [70] H. Nishimura, A. Nakashiba, M. Nakakura and K. Sasai, "Fatigue behavior of medium-density polyethylene pipes for gas distribution," *Polym. Eng. Sci.*, vol. 33, no. 14, pp. 895–900, Jul. 1993, doi: 10.1002/pen.760331405.
- [71] S. Hobeika, Y. Men and G. Strobl, "Temperature and Strain Rate Independence of Critical Strains in Polyethylene and Poly(ethylene- c o -vinyl acetate)," *Macromolecules*, vol. 33, no. 5, pp. 1827–1833, Mar. 2000, doi: 10.1021/ma9910484.
- [72] K. Noda, A. Takahara and T. Kajiyama, "Fatigue failure mechanisms of short glass-fiber reinforced nylon 66 based on nonlinear dynamic viscoelastic measurement," *Polymer (Guilaf)*, vol. 42, no. 13, pp. 58035811, Jun. 2001, doi: 10.1016/S0032-3861(00)00897-1.
- [73] F. Baltenneck, J.-P. Trotignon and J. Verdu, "Kinetics of fatigue failure of polystyrene," *Polym. Eng. Sci.*, vol. 37, no. 10, pp. 1740–1747, Oct. 1997, doi: 10.1002/pen.11822.
- [74] J. G. Williams, "A model of fatigue crack growth in polymers," *J. Mater. Sci.*, vol. 12, no. 12, pp. 2525–2533, Dec. 1977, doi: 10.1007/BF00553940.

- [75] N. E. Frost and D. S. Dugdale, "The propagation of fatigue cracks in sheet specimens," *J. Mech. Phys. Solids*, vol. 6, no. 2, pp. 92–110, Jan. 1958, doi: 10.1016/0022-5096(58)90018-8.
- [76] N. E. Frost, K. J. Marsh and L. P. Pook, *Metal Fatigue*. 1974.
- [77] W. Weibull, "A theory of fatigue crack propagation in sheet specimens," in *Acta Metallurgica*, 1963, pp. 745–752.
- [78] P. C. Paris, M. P. Gomez and W. E. Anderson, "A rational analytic theory of fatigue," *Trend Eng.*, vol. 13, pp. 9–14, 1961.
- [79] R. Boukhili, F. Decharentenay and T. Vukhanh, "Effect of frequency and orientation on fatigue crack propagation in polyamide-12," *Int. J. Fatigue*, vol. 8, no. 3, pp. 127–134, Jul. 1986, doi: 10.1016/0142-1123(86)90003-4.
- [80] J. Karger-Kocsis, K. Friedrich and R. S. Bailey, "Fatigue crack propagation in short and long glass fiber reinforced injection-molded polypropylene composites," *Adv. Compos. Mater.*, vol. 1, no. 2, pp. 103–121, Jan. 1991, doi: 10.1163/156855191X00225.
- [81] M. H. Kothmann, R. Zeiler, A. Rios de Anda, A. Brückner and V. Altstadt, "Fatigue crack propagation behaviour of epoxy resins modified with silica-nanoparticles," *Polymer (Guilaf)*, vol. 60, pp. 157–163, Mar. 2015, doi: 10.1016/j.polymer.2015.01.036.
- [82] F. Ramsteiner and T. Armbrust, "Fatigue crack growth in polymers," *Polym. Test.*, vol. 20, no. 3, pp. 321–327, 2001, doi: 10.1016/S0142-9418(00)00039-8.
- [83] J. Wainstein, M. Chapetti, P. E. Montemartini and P. Frontini, "Fatigue Crack Propagation Evaluation of Several Commercial Grade Propylene Polymers," *Int. J. Polym. Mater.*, vol. 54, no. 7, pp. 575–587, Jul. 2005, doi: 10.1080/00914030390278707.
- [84] M. N. James, C. J. Christopher, Y. Lu and E. A. Patterson, "Fatigue crack growth and craze-induced crack tip shielding in polycarbonate," *Polymer (Guilaf)*, vol. 53, no. 7, pp. 1558–1570, 2012, doi: 10.1016/j.polymer.2012.01.032.
- [85] Q. Z. Fang, T. J. Wang and H. M. Li, "Overload-induced retardation of fatigue crack growth in polycarbonate," *Int. J. Fatigue*, vol. 30, no. 8, pp. 1419–1429, 2008, doi: 10.1016/j.ijfatigue.2007.10.005.

- [86] T. Colmer, S. R. Daniewicz, J. C. Newman and R. Moser, "Measuring fatigue crack growth and closure in Polyether Ether Ketone (PEEK)," *Int. J. Fatigue*, vol. 95, pp. 243–251, Feb. 2017, doi: 10.1016/j.ijfatigue.2016.10.025.
- [87] S. Arad, J. C. Radon and L. E. Culver, "Fatigue Crack Propagation in Polymethylmethacrylate; the Effect of the Mean Value of Stress Intensity Factor," *J. Mech. Eng. Sci.*, vol. 13, no. 2, pp. 75–81, Apr. 1971, doi: 10.1243/JMES_JOUR_1971_013_013_02.
- [88] S. A. Sutton, "Fatigue crack propagation in an epoxy polymer," *Eng. Fract. Mech.*, vol. 6, pp. 587–595, 1974.
- [89] J. C. Radon, "Fatigue crack growth in polymers," *Int. J. Fract.*, vol. 16, no. 6, pp. 533–552, Dec. 1980, doi: 10.1007/BF02265216.
- [90] K. Sadananda and A. K. Vasudevan, "Analysis of fatigue crack growth behavior in polymers using the unified approach," *Mater. Sci. Eng. A*, vol. 387–389, no. 1–2 SPEC. ISS., pp. 536–541, 2004, doi: 10.1016/j.msea.2004.01.115.
- [91] C. Kanchanomai and A. Thammaruechuc, "Effects of stress ratio on fatigue crack growth of thermoset epoxy resin," *Polym. Degrad. Stab.*, vol. 94, no. 10, pp. 1772–1778, 2009, doi: 10.1016/j.polymdegradstab.2009.06.012.
- [92] M. Rink, B. Guidetti, R. Frassine and L. Castellani, "Effect of notch severity on fatigue fracture in a rubber-modified glassy polymer," *J. Mater. Sci.*, vol. 29, no. 11, pp. 3071–3079, 1994, doi: 10.1007/BF0117622.
- [93] J. Furmanski and L. A. Pruitt, "Peak stress intensity dictates fatigue crack propagation in UHMWPE," *Polymer (Guilaf)*, vol. 48, no. 12, pp. 3512–3519, 2007, doi: 10.1016/j.polymer.2007.04.006.
- [94] A. Boonyapookana, A. Saengsai, S. Surapunt, K. Nagata and Y. Mutoh, "Time dependent fatigue crack growth behavior of silica particle reinforced epoxy resin composite," *Int. J. Fatigue*, vol. 87, pp. 288–293, Jun. 2016, doi: 10.1016/j.ijfatigue.2016.02.013.
- [95] M. Brillhart, B. L. Gregory and J. Botsis, "Fatigue fracture behaviour of PEEK: 1. Effects of load level," *Polymer (Guilaf)*, vol. 32, no. 9, pp. 1605–1611, Jan. 1991, doi: 10.1016/0032-3861(91)90395-Y.

- [96] M. Brillhart and J. Botsis, "Fracture behaviour of PEEK: 2. Effects of thickness and temperature," *Polymer (Guilaf)*, vol. 33, no. 24, pp. 52265232, 1992.
- [97] A. J. Kinloch, S. H. Lee and A. C. Taylor, "Improving the fracture toughness and the cyclic-fatigue resistance of epoxy-polymer blends," *Polymer (Guilaf)*, vol. 55, no. 24, pp. 6325–6334, Nov. 2014, doi: 10.1016/j.polymer.2014.10.018.
- [98] W. Elber, "The significance of fatigue crack closure," *ASTM STP*, vol. 486, pp. 230–243, 1971.
- [99] A. J. Cano, A. Salazar and J. Rodríguez, "Evaluation of different crack driving forces for describing the fatigue crack growth behaviour of PET- G," *Int. J. Fatigue*, vol. 107, no. October 2017, pp. 27–32, 2018, doi: 10.1016/j.ijfatigue.2017.10.013.
- [100] C. Rans, R. Alderliesten and R. Benedictus, "Misinterpreting the results: How similitude can improve our understanding of fatigue delamination growth," *Compos. Sci. Technol.*, vol. 71, no. 2, pp. 230–238, 2011, doi: 10.1016/j.compscitech.2010.11.010.
- [101] M. Hojo, K. Tanaka, C. G. Gustafson and R. Hayashi, "Effect of stress ratio on near-threshold propagation of delamination fatigue cracks in unidirectional CFRP," *Compos. Sci. Technol.*, vol. 29, no. 4, pp. 273–292, 1987, doi: 10.1016/0266-3538(87)90076-5.
- [102] S. Mall, G. Ramamurthy and M. A. Rezaizdeh, "Stress ratio effect on cyclic debonding in adhesively bonded composite joints," *Compos. Struct.*, vol. 8, no. 1, pp. 31–45, 1987.
- [103] M. G. Wyzgoski and G. E. Novak, "Fatigue fracture of nylon polymers Part II Effect of glass-fibre reinforcement," *J. Mater. Sci.*, vol. 26, pp. 6314–6324, 1991, doi: 10.1007/BF02387810.
- [104] A. Pegoretti and T. Ricco, "Fatigue crack propagation in polypropylene reinforced with short glass fibers," *Compos. Sci. Technol.*, vol. 59, pp. 1055–1062, 1999, doi: 10.1016/S0266-3538(98)00143-2.
- [105] A. J. Brunner, N. Murphy and G. Pinter, "Development of a standardized procedure for the characterization of interlaminar delamination propagation in advanced composites under fatigue mode I loading conditions," *Eng. Fract. Mech.*, vol. 76, no. 18, pp. 2678–2689, 2009, doi: 10.1016/j.engfracmech.2009.07.014.

- [106] S. Azari, G. Jhin, M. Papini and J. K. Spelt, "Fatigue threshold and crack growth rate of adhesively bonded joints as a function of load/displacement ratio," *Compos. Part A Appl. Sci. Manuf.*, vol. 57, pp. 59–66, 2014, doi: 10.1016/j.compositesa.2013.11.001.
- [107] J. A. Pascoe, R. C. Alderliesten and R. Benedictus, "Methods for the prediction of fatigue delamination growth in composites and adhesive bonds - A critical review," *Eng. Fract. Mech.*, vol. 112–113, pp. 72–96, 2013, doi: 10.1016/j.engfracmech.2013.10.003.
- [108] R. Jones, S. Stelzer and A. J. Brunner, "Mode I, II and Mixed Mode I/II delamination growth in composites," *Compos. Struct.*, vol. 110, no. 1, pp. 317–324, 2014, doi: 10.1016/j.compstruct.2013.12.009.
- [109] R. Khan, R. Alderliesten, S. Badshah and R. Benedictus, "Effect of stress ratio or mean stress on fatigue delamination growth in composites: Critical review," *Compos. Struct.*, vol. 124, pp. 214–227, 2015, doi: 10.1016/j.compstruct.2015.01.016.
- [110] R. Jones, A. J. Kinloch and W. Hu, "Cyclic-fatigue crack growth in composite and adhesively-bonded structures: The FAA slow crack growth approach to certification and the problem of similitude," *Int. J. Fatigue*, vol. 88, pp. 10–18, 2016, doi: 10.1016/j.ijfatigue.2016.03.008.
- [111] I. Simon, L. Banks-Sills and V. Fourman, "Mode I delamination propagation and R-ratio effects in woven composite DCB specimens for a multi-directional layup," *Int. J. Fatigue*, vol. 96, pp. 237–251, Mar. 2017, doi: 10.1016/j.ijfatigue.2016.12.005.
- [112] Rapra, "Polyamides as Engineering Thermoplastic Materials," *I.B. Page*, 2001.
- [113] L. W. McKeen, "Polyamides (Nylons)," in *Fatigue and Tribological Properties of Plastics and Elastomers, second edition*, William Andrew Publishing, 2010, pp. 175–228.
- [114] J. Happian-Smith, *An introduction to modern vehicle design*. Reed Educational and Professional Publishing Ltd, 2001.
- [115] A. Paesano and D. Ph, "Polymeric Additive Manufacturing : Present Status and Future Trends of Materials and Processes," 2016.
- [116] B. Van Hooreweder, F. De Coninck, D. Moens, R. Boonen and P. Sas, "Microstructural characterization of SLS-PA12 specimens under

- dynamic tension/compression excitation," *Polym. Test.*, vol. 29, no. 3, pp. 319–326, 2010, doi: 10.1016/j.polymertesting.2009.12.006.
- [117] B. Van Hooreweder and J. P. Kruth, "High cycle fatigue properties of selective laser sintered parts in polyamide 12," *CIRP Ann. - Manuf. Technol.*, vol. 63, no. 1, pp. 241–244, 2014, doi: 10.1016/j.cirp.2014.03.060.
- [118] J. Munguia and K. Dalgarno, "Fatigue behaviour of laser sintered Nylon 12 in rotating and reversed bending tests," *Mater. Sci. Technol.*, vol. 31, no. 8, pp. 904–911, 2015, doi: 10.1179/1743284715y.0000000014.
- [119] J. Munguia and K. Dalgarno, "Fatigue behaviour of laser-sintered PA12 specimens under four-point rotating bending," *Rapid Prototyp. J.*, vol. 20, no. 4, pp. 291–300, 2014, doi: 10.1108/RPJ-07-2012-0064.
- [120] H. Amel, J. Rongong, H. Moztafzadeh and N. Hopkinson, "Effect of section thickness on fatigue performance of laser sintered nylon 12," *Polym. Test.*, vol. 53, pp. 204–210, Aug. 2016, doi: 10.1016/j.polymer-testing.2016.05.027.
- [121] D. Schob *et al.*, "Experimental determination and numerical simulation of material and damage behavior of 3D printed polyamide 12 under cyclic loading," *Eng. Fract. Mech.*, vol. 229, 2020, doi: doi.org/10.24423/aom.3162.
- [122] Y. J. Kim, H. You, S. J. Kim and G. J. Yun, "Effects of porosity on the fatigue life of polyamide 12 considering crack initiation and propagation," *Adv. Compos. Mater.*, vol. 29, no. 4, pp. 399–421, Jul. 2020, doi: 10.1080/09243046.2020.1738635.
- [123] E. Castillo, A. Fernández-Canteli and D. Siegele, "Obtaining S-N curves from crack growth curves: an alternative to self-similarity," *Int. J. Fract.*, vol. 187, no. 1, pp. 159–172, May 2014, doi: 10.1007/s10704-014-9928-6.
- [124] M. Blattmeier, G. Witt, J. Wortberg, J. Eggert and J. Toepker, "Influence of surface characteristics on fatigue behaviour of laser sintered plastics," *Rapid Prototyp. J.*, vol. 18, no. 2, pp. 161–171, 2012, doi: 10.1108/13552541211212140.
- [125] H. Kitagawa and S. Takahashi, "Applicability of fracture mechanics to very small cracks or the cracks in the early stage," in *Proceedings of the Second International Conference on Mechanical Behavior of Materials.*, 1976, pp. 627–631.

- [126] F. Paris, P., Erdogan, "A critical analysis of crack propagation laws," *ASME J. basic Eng.*, vol. 85(4), pp. 528–533, 1963.
- [127] M. H. El Haddad, K. N. Smith and T. H. Topper, "Fatigue Crack Propagation of Short Cracks," *Am. Soc. Mech. Eng.*, no. 78-Mat-7, 1978, doi: 10.1016/b0-08-043152-6/00516-7.
- [128] M. H. El Haddad, K. N. Smith and T. H. Topper, "Fatigue Crack Propagation of Short Cracks," *J. Eng. Mater. Technol.*, vol. 101, no. 1, p. 42, 2010, doi: 10.1115/1.3443647.
- [129] C. Garb, M. Leitner, B. Stauder, D. Schnubel and F. Grün, "Application of modified Kitagawa-Takahashi diagram for fatigue strength assessment of cast Al-Si-Cu alloys," *Int. J. Fatigue*, vol. 111, no. January, pp. 256–268, 2018, doi: 10.1016/j.ijfatigue.2018.01.030.
- [130] R. Aigner, S. Pusterhofer, S. Pomberger, M. Leitner and M. Stoschka, "A probabilistic Kitagawa-Takahashi diagram for fatigue strength assessment of cast aluminium alloys," *Mater. Sci. Eng. A*, vol. 745, no. November 2018, pp. 326–334, 2019, doi: 10.1016/j.msea.2018.12.108.
- [131] K. Tanaka, Y. Nakai and M. Yamashita, "Fatigue growth threshold of small cracks," *Int. J. Fract.*, vol. 17, no. 5, pp. 519–533, 1981, doi: 10.1007/BF00033345.
- [132] R. O. Ritchie and J. Lankford, "in Small Fatigue Cracks," Warrendale: AIME, 1986, pp. 559–586.
- [133] K. Sadananda and S. Sarkar, "Modified Kitagawa diagram and transition from crack nucleation to crack propagation," *Metall. Mater. Trans. A Phys. Metall. Mater. Sci.*, vol. 44, no. 3, pp. 1175–1189, 2013, doi: 10.1007/s11661-012-1416-x.
- [134] J. . Peters and R. . Ritchie, "Foreign-object damage and high-cycle fatigue of Ti-6Al-4V," *Mater. Sci. Eng. A*, vol. 319–321, pp. 597–601, Dec. 2001, doi: 10.1016/S0921-5093(01)00982-0.
- [135] Electro Optical Solutions, "PA 2200 Datasheet." 2007. [Online]. Available: <http://www.3dformtech.fi/lataukset/Material-Data-PA2200.pdf>
- [136] Evonik, "VESTAMID: Polyamide 12. Innovative and reliable".
- [137] GRANTA, "CES EduPack." 2020.

- [138] L. Li, C. Y. Li, C. Ni, L. Rong and B. Hsiao, "Structure and crystallization behavior of Nylon 66/multi-walled carbon nanotube nanocomposites at low carbon nanotube contents," *Polymer (Guildf)*, vol. 48, no. 12, pp. 3452–3460, 2007, doi: 10.1016/j.polymer.2007.04.030.
- [139] Z. Cai *et al.*, "The structure evolution of polyamide 1212 after stretched at different temperatures and its correlation with mechanical properties," *Polymer (Guildf)*, vol. 117, pp. 249–258, 2017, doi: 10.1016/j.polymer.2017.04.037.
- [140] E. Moeskops, N. Kamperman, B. van der Vorst and R. Knoppers, "Creep behaviour of Polyamide in Selective Laser Sintering," vol. 19, no. 1, p. 55, 2004, [Online]. Available: <http://eprints.uanl.mx/5481/1/1020149995.PDF>
- [141] B. Crist and J. M. Schultz, "Polymer spherulites: A critical review," *Prog. Polym. Sci.*, vol. 56, pp. 1–63, 2016, doi: 10.1016/j.progpolymsci.2015.11.006.
- [142] S. Gogolewski, K. Czerntawska and M. Gastorek, "Effect of annealing on thermal properties and crystalline structure of polyamides. Nylon 12 (polylauro lactam)," *Colloid Polym. Sci.*, vol. 258, no. 10, pp. 1130–1136, Oct. 1980, doi: 10.1007/BF01382456.
- [143] American Society for Testing and Materials, *ASTM D5023-07: Standard Test Method for Plastics: Dynamic Mechanical Properties: In Flexure (Three-Point Bending)*. 2007.
- [144] American Society for Testing and Materials, "ASTM D638-14: Standard Test Method for Tensile Properties of Plastics," *Annu. B. ASTM Stand.*, pp. 1–15, 2015, doi: 10.1520/D0638-14.1.
- [145] American Society for Testing and Materials, "ASTM D5045-99: Standard Test Methods for Plane-Strain Fracture Toughness and Strain Energy Release Rate of Plastic Materials," *Annu. B. ASTM Stand.*, vol. 99, no. Reapproved, pp. 1–9, 1996, doi: 10.1520/D5045-99R07E01.2.
- [146] American Society for Testing and Materials, *ASTM E647-13a: Standard Test Method for Measurement of Fatigue Crack Growth Rates*. 2014, pp. 1–50. doi: 10.1520/E0647-13A.2.
- [147] W. J. G. (Eds) Moore, D.R., Pavan, A., *Fracture Mechanics Testing Methods for Polymers, Adhesives and Composites*. Holanda: Elsevier Science Ltd. And ESIS, 2001. doi: 10.1017/CBO9781107415324.004.

- [148] M. Crespo, "Fractura a altas velocidades de deformación de probetas entalladas de poliamida 12 fabricadas por sinterizado láser selectivo," Universidad Rey Juan Carlos, 2019.
- [149] International Organization for Standardization, "ISO 13586:2000. Plastics - Determination of fracture Toughness- Linear Elastic Fracture Mechanics (LEFM)." 2000.
- [150] American Society for Testing and Materials, *ASTM E1820-13: Standard Test Method for Measurement of Fracture Toughness*. 2013, pp. 1–54. doi: 10.1520/E1820-13.Copyright.
- [151] G. E. Hale and F. Ramsteiner, "J-fracture toughness of polymers at slow speed," in *Fracture mechanics testing methods for polymers, adhesives and composites.*, vol. 1, D. R. Moore, A. Pavan and J. G. Williams, Eds. The Netherlands: Elsevier Science Ltd., and ESIS, 2001, pp. 123–157. doi: 9780080436890.
- [152] L. Castellani, "Fatigue crack growth of polymers," in *Fracture mechanics testing methods for polymers, adhesives and composites.*, W. J. G. (Eds) Moore, D.R., Pavan, A., Ed. The Netherlands: Elsevier Science Ltd., and ESIS, 2001, pp. 91–118.
- [153] American Society for Testing and Materials, "ASTM D7791-12: Standard Test Method for Uniaxial Fatigue Properties of Plastics," *Annu. B. ASTM Stand.*, vol. i, pp. 1–15, 2005, doi: 10.1520/D7791-12.2.
- [154] R. C. Rice, "Fatigue Data Analysis," in *Metals Handbook, 9th, Vol. 8, Mechanical Testing and Evaluation*, ASM International, 1985. doi: 10.31399/asm.hb.v08.a0009219.
- [155] Martín-Meizoso, "Cálculo del Límite de Fatiga mediante el Método de Máxima Verosimilitud," *An. Mecánica la Fract.*, vol. 2, no. November 2014, pp. 406–410, 2009.
- [156] P. Davoli, A. Bernasconi, M. Filippini, S. Foletti and I. V. Papadopoulos, "Independence of the torsional fatigue limit upon a mean shear stress," *Int. J. Fatigue*, vol. 25, no. 6, pp. 471–480, 2003, doi: 10.1016/S0142- 1123(02)00174-3.
- [157] C. Müller, M. Wachter, R. Masendorf and A. Esderts, "Accuracy of fatigue limits estimated by the staircase method using different evaluation techniques," *Int. J. Fatigue*, vol. 100, pp. 296–307, 2017, doi: 10.1016/j.ijfatigue.2017.03.030.

- [158] D. Petersen, R. Link, J. Braam and S. van der Zwaag, "A Statistical Evaluation of the Staircase and the ArcSinVP Methods for Determining the Fatigue Limit," *J. Test. Eval.*, vol. 26, no. 2, p. 125, 1998, doi: 10.1520/JTE11982J.
- [159] S. Cravero and C. Ruggieri, "Estimation procedure of J-resistance curves for SE(T) fracture specimens using unloading compliance," *Eng. Fract. Mech.*, vol. 74, no. 17, pp. 2735–2757, Nov. 2007, doi: 10.1016/j.engfracmech.2007.01.012.
- [160] J. Guo, J. Bai, K. Liu and J. Wei, "Surface quality improvement of selective laser sintered polyamide 12 by precision grinding and magnetic field- assisted finishing," *Mater. Des.*, vol. 138, no. January 2018, pp. 39–45, 2018, doi: 10.1016/j.matdes.2017.10.048.
- [161] Z. Xu, Y. Wang, D. Wu, K. P. Ananth and J. Bai, "The process and performance comparison of polyamide 12 manufactured by multi jet fusion and selective laser sintering," *J. Manuf. Process.*, vol. 47, no. June, pp. 419–426, 2019, doi: 10.1016/j.jmapro.2019.07.014.
- [162] I. Raphael, N. Saintier, G. Robert, J. Béga and L. Laiarinandrasana, "On the role of the spherulitic microstructure in fatigue damage of pure polymer and glass-fiber reinforced semi-crystalline polyamide 6.6," *Int. J. Fatigue*, vol. 126, no. April, pp. 44–54, 2019, doi: 10.1016/j.ijfatigue.2019.04.036.
- [163] D. J. Sheskin, *Parametric and non parametric statistical procedures: Second edition*. LLC, FL., 2003.
- [164] G. V. Salmoria, J. L. Leite, L. F. Vieira, A. T. N. Pires and C. R. M. Roesler, "Mechanical properties of PA6/PA12 blend specimens prepared by selective laser sintering," *Polym. Test.*, vol. 31, no. 3, pp. 411–416, 2012, doi: 10.1016/j.polymertesting.2011.12.006.
- [165] R. Greco and L. Nicolais, "Glass transition temperature in nylons," *Polymer (Guildf.)*, vol. 17, no. 12, pp. 1049–1053, Dec. 1976, doi: 10.1016/0032-3861(76)90005-7.
- [166] G. V. Salmoria, J. L. Leite, L. F. Vieira, A. T. N. Pires and C. R. M. Roesler, "Mechanical properties of PA6/PA12 blend specimens prepared by selective laser sintering," *Polym. Test.*, vol. 31, no. 3, pp. 411–416, 2012, doi: 10.1016/j.polymertesting.2011.12.006.

- [167] X. Cui and D. Yan, "Preparation, characterization and crystalline transitions of odd-even polyamides 11,12 and 11,10," *Eur. Polym. J.*, vol. 41, no. 4, pp. 863–870, 2005, doi: 10.1016/j.eurpolymj.2004.10.045.
- [168] W. Zhu, C. Yan, Y. Shi, S. Wen, J. Liu and Y. Shi, "Investigation into mechanical and microstructural properties of polypropylene manufactured by selective laser sintering in comparison with injection molding counterparts," *Mater. Des.*, vol. 82, pp. 37–45, 2015, doi: 10.1016/j.matdes.2015.05.043.
- [169] B. Crist, C. J. Fisher and P. R. Howard, "Mechanical properties of model polyethylenes: tensile elastic modulus and yield stress," *Macromolecules*, vol. 22, no. 4, pp. 1709–1718, Apr. 1989, doi: 10.1021/ma00194a035.
- [170] T. Yu, C. M. Wu, C. Y. Chang, C. Y. Wang and S. P. Rwei, "Effects of crystalline morphologies on the mechanical properties of carbon fiber reinforcing polymerized cyclic butylene terephthalate composites," *Express Polym. Lett.*, vol. 6, no. 4, pp. 318–328, 2012, doi: 10.3144/expresspolymlett.2012.35.
- [171] A. A. Mousa, "The effects of content and surface modification of filler on the mechanical properties of selective laser sintered polyamide12 composites," *Jordan J. Mech. Ind. Eng.*, vol. 8, no. 5, pp. 265–274, 2014.
- [172] W. Hao, Y. Liu, T. Wang, G. Guo, H. Chen and D. Fang, "Failure analysis of 3D printed glass fiber/PA12 composite lattice structures using DIC," *Compos. Struct.*, vol. 225, no. June, p. 111192, 2019, doi: 10.1016/j.compstruct.2019.111192.
- [173] P. E. Bretz, R. W. Hertzberg and J. A. Manson, "The effect of molecular weight on fatigue crack propagation in nylon 66 and polyacetal," *J. Appl. Polym. Sci.*, vol. 27, no. 5, pp. 1707–1717, May 1982, doi: 10.1002/app.1982.070270527.
- [174] L. Engel, H. Klingele, G. W. Ehrenstein and H. Schaper, *An Atlas of Polymer Damage*. Cologne, 1978.
- [175] A. Salazar, A. Rico, S. Rodríguez, J. M. Navarro and J. Rodríguez, "Relating fracture behavior to spherulite size in controlled-rheology polypropylenes," *Polym. Eng. Sci.*, vol. 52, no. 4, pp. 805–813, Apr. 2012, doi: 10.1002/pen.22145.

- [176] E. Castillo and A. Fernandez-Canteli, *A Unified Statistical Methodology for Modeling Fatigue Damage*. Dordrecht: Springer Netherlands, 2009. doi: 10.1007/978-1-4020-9182-7.
- [177] K. Friedrich, "Crazes and shear bands in semi-crystalline thermoplastics," in *Crazing in Polymers*, Berlin/Heidelberg: SpringerVerlag, pp. 225–274. doi: 10.1007/BFb0024059.
- [178] A. Pawlak and A. Galeski, "Plastic Deformation of Crystalline Polymers: The Role of Cavitation and Crystal Plasticity," *Macromolecules*, vol. 38, no. 23, pp. 9688–9697, Nov. 2005, doi: 10.1021/ma050842o.
- [179] G. Shen, J. A. Gianetto and W. R. Tyson, "Measurement of J-R Curves using single-specimen technique on clamped SE(T) specimens," 2009.
- [180] J. M. Larsen, A. H. Rosenberger, B. D. Worth, K. Li, D. C. Maxwell and W. K. Porter, "Assuring reliability of gamma titanium aluminides in longterm service," in *Gamma titanium aluminides. The Materials, Metals and Minerals Society*, 1999, pp. 463–472.
- [181] M. Ciavarella and F. Monno, "On the possible generalizations of the Kitagawa-Takahashi diagram and of the El Haddad equation to finite life," *Int. J. Fatigue*, vol. 28, no. 12, pp. 1826–1837, 2006, doi: 10.1016/j.ijfatigue.2005.12.001.
- [182] G. Hénaff and A.-L. Gloanec, "Fatigue properties of TiAl alloys," *Intermetallics*, vol. 13, no. 5, pp. 543–558, May 2005, doi: 10.1016/j.intermet.2004.09.007.