



DAFTAR PUSTAKA

- Ahmad, D., van den Boogaert, I., Miller, J., Presswell, R., & Jouhara, H., 2018, Hydrophilic and hydrophobic materials and their applications. *Energy Sources, Part A: Recovery, Utilization and Environmental Effects*, 40(22), 2686–2725.
- Ahmed, F. E., Lalia, B. S., & Hashaikeh, R., 2015, A review on electrospinning for membrane fabrication: Challenges and applications. *Desalination*, 356, 15–30.
- Ahn, Y. C., Park, S. K., Kim, G. T., Hwang, Y. J., Lee, C. G., Shin, H. S., & Lee, J. K., 2006, Development of high efficiency nanofilters made of nanofibers. *Current Applied Physics*, 6(6 SPEC. ISS.), 1030–1035.
- Akhtar, K., Khan, S. A., Khan, S. B., & Asiri, A. M., 2018, Scanning electron microscopy: Principle and applications in nanomaterials characterization. *Handbook of Materials Characterization*, 113–145.
- Barnes, C. P., Sell, S. A., Boland, E. D., Simpson, D. G., & Bowlin, G. L., 2007, Nanofiber technology: Designing the next generation of tissue engineering scaffolds. *Advanced Drug Delivery Reviews*, 59(14), 1413–1433.
- Basu, P., Repanas, A., Chatterjee, A., Glasmacher, B., NarendraKumar, U., & Manjubala, I., 2017, PEO–CMC blend nanofibers fabrication by electrospinning for soft tissue engineering applications. *Materials Letters*, 195, 10–13.
- Bhardwaj, N., & Kundu, S. C., 2010, Electrospinning: A fascinating fiber fabrication technique. *Biotechnology Advances*, 28(3), 325–347.
- Chen, G., Guo, J., Nie, J., & Ma, G., 2016, Preparation, characterization, and application of PEO/HA core shell nanofibers based on electric field induced phase separation during electrospinning. *Polymer*, 83, 12–19.
- David Richard Schmidt, Heather Waldeck, & Weiyuan John Kao., 2009, Protein Adsorption to Biomaterials. In *Biological Interactions on Materials Surfaces*, 199, 1-18.
- Ding, J., Zhang, J., Li, J., Li, D., Xiao, C., Xiao, H., Yang, H., Zhuang, X., & Chen, X., 2019, Electrospun polymer biomaterials. *Progress in Polymer*

Science, 90, 1–34.

- Ding, Z., Liu, X., Liu, Y., & Zhang, L., 2016, Enhancing the Compatibility, Hydrophilicity and Mechanical Properties of Polysulfone Ultrafiltration Membranes with Lignocellulose Nanofibrils. *Polymers* 2016, Vol. 8, Page 349, 8(10), 349.
- Dou, X. Q., Zhang, D., & Feng, C. L., 2013, Wettability of supramolecular nanofibers for controlled cell adhesion and proliferation. *Langmuir*, 29(49), 15359–15366.
- Eatemadi, A., Daraee, H., Zarghami, N., Yar, H. M., & Akbarzadeh, A., 2016, Nanofiber: Synthesis and biomedical applications. *Artificial Cells, Nanomedicine and Biotechnology*, 44(1), 111–121.
- Faul, C. F. J., & Antonietti, M., 2003, Ionic self-assembly: Facile synthesis of supramolecular materials. *Advanced Materials*, 15(9), 673–683.
- Feng, L., Li, S., Li, H., Zhai, J., Song, Y., Jiang, L., & Zhu, D., 2002, Superhydrophobic surface of aligned polyacrylonitrile nanofibers. *Angewandte Chemie - International Edition*, 41(7), 1221–1223.
- Gölander, C.-G., Herron, J. N., Lim, K., Claesson, P., Stenius, P., & Andrade, J. D., 1992, Properties of Immobilized PEG Films and the Interaction with Proteins. In *Poly(Ethylene Glycol) Chemistry*.
- He, J. H., Wan, Y. Q., & Yu, J. Y., 2005, Scaling law in electrospinning: Relationship between electric current and solution flow rate. *Polymer*, 46(8), 2799–2801.
- Hu, B., Miao, L., Zhao, Y., & Lü, C., 2017, Azide-assisted crosslinked quaternized polysulfone with reduced graphene oxide for highly stable anion exchange membranes. *Journal of Membrane Science*, 530, 84–94.
- Huang, T., Wang, C., Yu, H., Wang, H., Zhang, Q., & Zhu, M., 2014, Human walking-driven wearable all-fiber triboelectric nanogenerator containing electrospun polyvinylidene fluoride piezoelectric nanofibers. *Nano Energy*, 14, 226–235.
- Huang, Z. M., Zhang, Y. Z., Kotaki, M., & Ramakrishna, S., 2003, A review on polymer nanofibers by electrospinning and their applications in



- nanocomposites. *Composites Science and Technology*, 63(15), 2223–2253.
- Huie, J. C., 2003, Guided molecular self-assembly: A review of recent efforts. *Smart Materials and Structures*, 12(2), 264–271.
- Hunley, M. T., & Long, T. E., 2008, Electrospinning functional nanoscale fibers: A perspective for the future. *Polymer International*, 57(3), 385–389.
- Inkson, B. J., 2016, Scanning electron microscopy (SEM) and transmission electron microscopy (TEM) for materials characterization. *Materials Characterization Using Nondestructive Evaluation (NDE) Methods*, 17–43.
- Jose, A. J., & Alagar, M., 2011, Development of bioactive polysulfone nanocomposites for bone tissue replacement. *ICCM International Conferences on Composite Materials*.
- Kim, G., & Kim, W., 2007, Highly porous 3D nanofiber scaffold using an electrospinning technique. *Journal of Biomedical Materials Research - Part B Applied Biomaterials*, 81(1), 104–110.
- Kim, H., Lee, Y. J., Lee, D. C., Park, G. G., & Yoo, Y., 2013, Fabrication of the carbon paper by wet-laying of ozone-treated carbon fibers with hydrophilic functional groups. *Carbon*, 60, 429–436.
- Ko, S. W., Lee, J. Y., Lee, J., Son, B. C., Jang, S. R., Aguilar, L. E., Oh, Y. M., Park, C. H., & Kim, C. S., 2019, Analysis of drug release behavior utilizing the swelling characteristics of cellulosic nanofibers. *Polymers*, 11(9), 1–8.
- Ko, S. W., Lee, J. Y., Lee, J., Son, B. C., Jang, S. R., Aguilar, L. E., Oh, Y. M., Park, C. H., & Kim, C. S., 2019, Analysis of Drug Release Behavior Utilizing the Swelling Characteristics of Cellulosic Nanofibers. *Polymers 2019, Vol. 11, Page 1376*, 11(9), 1376.
- Kumbar, S. G., James, R., Nukavarapu, S. P., & Laurencin, C. T., 2008, Electrospun nanofiber scaffolds: Engineering soft tissues. *Biomedical Materials*, 3(3).
- Lannutti, J., Reneker, D., Ma, T., Tomasko, D., & Farson, D., 2007, Electrospinning for tissue engineering scaffolds. *Materials Science and Engineering C*, 27(3), 504–509.
- Laurencin, C.T. and Nair, L.S., 2014, *Nanotechnology and regenerative*



engineering: the scaffold. CRC Press.

- Law, K. Y., & Zhao, H., 2015, Surface wetting: Characterization, contact angle, and fundamentals. In *Surface Wetting: Characterization, Contact Angle, and Fundamentals*.
- Li, D., & Xia, Y., 2004, Electrospinning of nanofibers: Reinventing the wheel? *Advanced Materials*, 16(14), 1151–1170.
- Liang, D., Hsiao, B. S., & Chu, B., 2007, Functional electrospun nanofibrous scaffolds for biomedical applications. *Advanced Drug Delivery Reviews*, 59(14), 1392–1412.
- Lin, C. M., Chang, Y. C., Cheng, L. C., Liu, C. H., Chang, S. C., Hsien, T. Y., Wang, D. M., & Hsieh, H. J., 2020, Preparation of graphene-embedded hydroxypropyl cellulose/chitosan/polyethylene oxide nanofiber membranes as wound dressings with enhanced antibacterial properties. *Cellulose*, 27(5), 2651–2667.
- Liu, C., Xia, Z., & Czernuszka, J. T., 2007, Design and development of three-dimensional scaffolds for tissue engineering. *Chemical Engineering Research and Design*, 85(7 A), 1051–1064.
- Lou, L. H., Qin, X. H., & Zhang, H., 2017, Preparation and study of low-resistance polyacrylonitrile nano membranes for gas filtration. *Textile Research Journal*, 87(2), 208–215.
- Lou, L., Kendall, R. J., Smith, E., & Ramkumar, S. S., 2020, Functional PVDF/rGO/TiO₂ nanofiber webs for the removal of oil from water. *Polymer*, 186.
- Lou, L., Osemwegie, O., & Ramkumar, S. S., 2020, Functional Nanofibers and Their Applications. *Industrial and Engineering Chemistry Research*, 59(13), 5439–5455.
- Lou, L., Subbiah, S., Smith, E., Kendall, R. J., & Ramkumar, S. S., 2019, Functional PVA/VB2/TiO₂ Nanofiber Webs for Controlled Drug Delivery. *ACS Applied Bio Materials*, 2(12), 5916–5929.
- Lou, L., Wang, J., Lee, Y. J., & Ramkumar, S. S., 2019, Visible Light Photocatalytic Functional TiO₂/PVDF Nanofibers for Dye Pollutant



- Degradation. *Particle and Particle Systems Characterization*, 36(9).
- Ma, L., Deng, L., & Chen, J., 2014, Applications of poly(ethylene oxide) in controlled release tablet systems: A review. *Drug Development and Industrial Pharmacy*, 40(7), 845–851.
- Male, U., Shin, B. K., & Huh, D. S., 2017, Graphene oxide incorporated poly(ϵ -caprolactone) honeycomb-patterned porous polymer films by the breath figure method. *Macromolecular Research*, 25(3), 297–302.
- Martin, C. R., 1996, Membrane-based synthesis of nanomaterials. *Chemistry of Materials*, 8(8), 1739–1746.
- Menzies, K. L., & Jones, L., 2010, The impact of contact angle on the biocompatibility of biomaterials. *Optometry and Vision Science*, 87(6), 387–399.
- Mohamed, M. A., Jaafar, J., Ismail, A. F., Othman, M. H. D., & Rahman, M. A., 2017, Fourier Transform Infrared (FTIR) Spectroscopy. In *Membrane Characterization*. Elsevier B.V.
- Mohammadi, F., Mohammadi, F., & Yavari, Z., 2021, Characterization of the cylindrical electrospun nanofibrous polysulfone membrane for hemodialysis with modelling approach. *Medical and Biological Engineering and Computing*, 59(7–8), 1629–1641.
- Mohammadi, Farideh, Afsaneh Valipouri, Dariush Semnani, and Fereshteh Alsahebfosoul., 2018, Nanofibrous Tubular Membrane for Blood Hemodialysis. *Applied Biochemistry and Biotechnology* 186(2):443–58.
- Mushtaq, A., Mukhtar, H. Bin, & Shariff, A. M., 2014, FTIR study of enhanced polymeric blend membrane with amines. *Research Journal of Applied Sciences, Engineering and Technology*, 7(9), 1811–1820.
- Mwiiri, F. K., & Daniels, R., 2020, Electrospun nanofibers for biomedical applications. *Delivery of Drugs: Volume 2: Expectations and Realities of Multifunctional Drug Delivery Systems*, 53–74.
- Nobakht, D., & Abedini, R., 2022, Improved gas separation performance of Pebax®1657 membrane modified by poly-alcoholic compounds. *Journal of Environmental Chemical Engineering*, 10(3), 107568.



- Ogueri, K. S., & Laurencin, C. T., 2020, Nanofiber Technology for Regenerative Engineering. *ACS Nano*, 14(8), 9347–9363.
- Ones, D. A. E. J., 1978, Fourier Transform Infrared Spectra. *Fourier Transform Infrared Spectra*.
- Paterlini, Thais T., Lucas F. B. Nogueira, Camila B. Tovani, Marcos A. E. Cruz, Rafael Derradi, and Ana P. Ramos., 2017, The Role Played by Modified Bioinspired Surfaces in Interfacial Properties of Biomaterials. *Biophysical Reviews* 9(5):683–98.
- Polini, A., & Yang, F., 2017, Physicochemical characterization of nanofiber composites. In *Nanofiber Composites for Biomedical Applications*. Elsevier Ltd.
- Rahimy, M. H., Peyman, G. A., Chin, S. Y., Golshani, R., Aras, C., Borhani, H., & Thompson, H., 1994, Polysulfone capillary fiber for intraocular drug delivery: In vitro and in vivo evaluations. *Journal of Drug Targeting*, 2(4), 289–298.
- Ramesh, S., Yuen, T. F., & Shen, C. J., 2008, Conductivity and FTIR studies on PEO-LiX [X: CF₃SO₃⁻, SO₄²⁻] polymer electrolytes. *Spectrochimica Acta - Part A: Molecular and Biomolecular Spectroscopy*, 69(2), 670–675.
- Ray, S. S., Chen, S. S., Hsu, H. Te, Cao, D. T., Nguyen, H. T., & Nguyen, N. C., 2017, Uniform hydrophobic electrospun nanofibrous layer composed of polysulfone and sodium dodecyl sulfate for improved desalination performance. *Separation and Purification Technology*, 186, 352–365.
- Reneker, D. H., & Yarin, A. L., 2008, Electrospinning jets and polymer nanofibers. *Polymer*, 49(10), 2387–2425.
- Serbanescu, O. S., Voicu, S. I., & Thakur, V. K., 2020, Polysulfone functionalized membranes: Properties and challenges. *Materials Today Chemistry*, 17, 100302.
- Shastri, V., 2005, Non-Degradable Biocompatible Polymers in Medicine: Past, Present and Future. *Current Pharmaceutical Biotechnology*, 4(5), 331–337.
- Sivaraman, K. M., Kellenberger, C., Pané, S., Ergeneman, O., Lühmann, T., Luechinger, N. A., Hall, H., Stark, W. J., & Nelson, B. J., 2012, Porous



polysulfone coatings for enhanced drug delivery. *Biomedical Microdevices*, 14(3), 603–612.

Song, J. W., & Fan, L. W., 2021, Temperature dependence of the contact angle of water: A review of research progress, theoretical understanding, and implications for boiling heat transfer. *Advances in Colloid and Interface Science*, 288, 102339.

Subbiah, T., Bhat, G. S., Tock, R. W., Parameswaran, S., & Ramkumar, S. S., 2005, Electrospinning of nanofibers. *Journal of Applied Polymer Science*, 96(2), 557–569.

Takht Ravanchi, M., Kaghazchi, T., & Kargari, A. 2009, Application of membrane separation processes in petrochemical industry: a review. *Desalination*, 235(1–3), 199–244.

Tamura, T., & Kawakami, H. 2010, Aligned electrospun nanofiber composite membranes for fuel cell electrolytes. *Nano Letters*, 10(4), 1324–1328.

Thompson, M. S., Vadala, T. P., Vadala, M. L., Lin, Y., & Riffle, J. S., 2008, Synthesis and applications of heterobifunctional poly(ethylene oxide) oligomers. *Polymer*, 49(2), 345–373.

Tseng, A. A., 2007, Recent developments in nanofabrication using scanning near-field optical microscope lithography. *Optics and Laser Technology*, 39(3), 514–526.

Ulbricht, M., 2006, Advanced functional polymer membranes. *Polymer*, 47(7), 2217–2262.

Vajtai, R., 2013, Springer handbook of nanomaterials. In *Springer Handbook of Nanomaterials*.

Wang, M., Yue, C. Y., & Chua, B. 2001, Production and evaluation of hydroxyapatite reinforced polysulfone for tissue replacement. *Journal of Materials Science: Materials in Medicine*, 12(9), 821–826.

Wang, P., Gong, P., Lin, Y., Qu, Y., Li, J., Kong, X., Chen, Z., & Man, Y., 2011, Nanofibrous electrospun barrier membrane promotes osteogenic differentiation of human mesenchymal stem cells. *Journal of Bioactive and Compatible Polymers*, 26(6), 607–618.



- Wang, X., & Hsiao, B. S., 2016, Electrospun nanofiber membranes. *Current Opinion in Chemical Engineering*, 12, 62–81.
- Wenz, L. M., Merritt, K., Brown, S. A., Moet, A., & Steffee, A. D., 1990, In vitro biocompatibility of polyetheretherketone and polysulfone composites. *Journal of Biomedical Materials Research*, 24(2), 207–215.
- Wouters, D., & Schubert, U. S., 2004, Nanolithography and nanochemistry: Probe-related patterning techniques and chemical modification for nanometer-sized devices. *Angewandte Chemie - International Edition*, 43(19), 2480–2495.
- Xiao, Y., Gong, T., Jiang, Y., Wang, Y., Wen, Z. T., Zhou, S., Bao, C., & Xu, X., 2016, Fabrication and characterization of a glucose-sensitive antibacterial chitosan-polyethylene oxide hydrogel. *Polymer*, 82, 1–10.
- Yildiz, O., Dirican, M., Fang, X., Fu, K., Jia, H., Stano, K., Zhang, X., & Bradford, P. D., 2019, Hybrid Carbon Nanotube Fabrics with Sacrificial Nanofibers for Flexible High Performance Lithium-Ion Battery Anodes. *Journal of The Electrochemical Society*, 166(4), A473–A479.
- Yu, D., Zhu, L., White, K., Health, C. B.-W.-, & 2009, U., 2009, Electrospun nanofiber-based drug delivery systems. *Scirp.Org*.
- Zhang, Q., Shi, B., Ding, J., Yan, L., Thawani, J. P., Fu, C., & Chen, X., 2019, Polymer scaffolds facilitate spinal cord injury repair. *Acta Biomaterialia*, 88, 57–77.
- Zhang, Y., He, X., Li, J., Miao, Z., & Huang, F., 2008, Fabrication and ethanol-sensing properties of micro gas sensor based on electrospun SnO₂ nanofibers. *Sensors and Actuators, B: Chemical*, 132(1), 67–73.
- Zhao, Y. F., Zhu, L. P., Yi, Z., Zhu, B. K., & Xu, Y. Y., 2013, Improving the hydrophilicity and fouling-resistance of polysulfone ultrafiltration membranes via surface zwitterionicalization mediated by polysulfone-based triblock copolymer additive. *Journal of Membrane Science*, 440, 40–47.
- Zhou, F. L., & Gong, R. H., 2008, Manufacturing technologies of polymeric nanofibres and nanofibre yarns. *Polymer International*, 57(6), 837–845.
- Zhou, W., Apkarian, R., Wang, Z. L., & Joy, D., 2007, Fundamentals of scanning



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FABRIKASI MEMBRAN NANOFIBER POLYSULFONE (PSF)/POLYETHYLENE OXIDE (PEO) DAN
POTENSINYA SEBAGAI
BIOMATERIAL

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electron microscopy (SEM). *Scanning Microscopy for Nanotechnology: Techniques and Applications*, 1–40.

Zussman, E., Theron, A., & Yarin, A. L., 2003, Formation of nanofiber crossbars in electrospinning. *Applied Physics Letters*, 82(6), 973–975.