

## DAFTAR PUSTAKA

- [1] A. M. Atta *et al.*, “New Epoxy and Hardener System Based on an Imidazolium Ionic Liquid as an Anticorrosive Coating for Steel in the Marine Environment,” *ACS Publication*, pp. 1–12, 2023, doi: 10.1021/acsomega.3c00979.
- [2] T. Yimyai, D. Crespy, M. Rohwerder, T. Yimyai, and D. Crespy, “Corrosion-responsive self-healing coatings,” 2023, doi: 10.1002/adma.202300101.
- [3] A. C. M. Silva, R. A. Renzetti, A. de S. Andrada, P. Singh, P. K. Rohatgi, and M. C. da Silva, “Adapted synthesis routes and healing evaluation of a self-healing anticorrosive coating,” *Journal of Coatings Technology and Research*, vol. 17, no. 5, pp. 1351–1361, 2020, doi: 10.1007/s11998-020-00356-x.
- [4] J. Kothari and J. O. Iroh, “Self-Healing Poly(urea formaldehyde) Microcapsules: Synthesis and Characterization,” *Polymers*, vol. 15, no. 7, 2023, doi: 10.3390/polym15071668.
- [5] D. Y. Zhu, M. Z. Rong, and M. Q. Zhang, “Self-healing polymeric materials based on microencapsulated healing agents: From design to preparation,” *Progress in Polymer Science*, vol. 49–50, pp. 175–220, 2015, doi: 10.1016/j.progpolymsci.2015.07.002.
- [6] S. Ataei, S. N. Khorasani, and R. E. Neisiany, “Biofriendly vegetable oil healing agents used for developing self-healing coatings: A review,” *Progress in Organic Coatings*, vol. 129, no. December 2018, pp. 77–95, 2019, doi: 10.1016/j.porgcoat.2019.01.012.
- [7] P. C. Calder, “Nutritional benefits of omega-3 fatty acids,” *Food Enrichment with Omega-3 Fatty Acids*, pp. 3–26, 2013, doi: 10.1533/9780857098863.1.3.
- [8] E. Adibzadeh, S. M. Mirabedini, F. Alizadegan, S. Dolatshah, and R. R. Farnood, “Synthesis of a dual-microcapsule system comprising 2-ethyl hexyl acrylate monomer and benzoyl peroxide initiator and study of their application in capsular adhesives,” *Colloids and Surfaces A: Physicochemical and Engineering Aspects*, vol. 627, no. June, p. 127139, 2021, doi: 10.1016/j.colsurfa.2021.127139.
- [9] R. K. Pittala and B. S. Ben, “Synthesis and characterization of amine hardener filled microcapsules for self-healing composite applications,” *Materials Research Express*, vol. 6, no. 11, 2019, doi: 10.1088/2053-1591/ab4734.
- [10] N. Z. Tomić, A. N. Mustapha, M. AlMheiri, N. AlShehhi, and A. Antunes, “Advanced application of drying oils in smart self-healing coatings for corrosion protection: Feasibility for industrial application,” *Progress in Organic Coatings*, vol. 172, no. August, 2022, doi: 10.1016/j.porgcoat.2022.107070.

- [11] T. Nesterova, K. Dam-Johansen, L. T. Pedersen, and S. Kiil, “Microcapsule-based self-healing anticorrosive coatings: Capsule size, coating formulation, and exposure testing,” *Progress in Organic Coatings*, vol. 75, no. 4, pp. 309–318, 2012, doi: 10.1016/j.porgcoat.2012.08.002.
- [12] H. Abdipour, M. Rezaei, and F. Abbasi, “Synthesis and characterization of high durable linseed oil-urea formaldehyde micro/nanocapsules and their self-healing behaviour in epoxy coating,” *Progress in Organic Coatings*, vol. 124, no. August, pp. 200–212, 2018, doi: 10.1016/j.porgcoat.2018.08.019.
- [13] N. Zheng, J. Liu, Y. Wang, C. Li, and Q. Zhang, “Preparation of chitosan-reduced graphene oxide (CS-RGO) microcapsules and its application in UV/moisture-induced self-healing coatings,” *Progress in Organic Coatings*, vol. 151, no. July 2020, p. 106055, 2021, doi: 10.1016/j.porgcoat.2020.106055.
- [14] H. Ullah, K. A. M. Azizli, Z. B. Man, M. B. Che Ismail, and M. I. Khan, “The potential of microencapsulated self-healing materials for microcracks recovery in self-healing composite systems: A review,” *Polymer Reviews*, vol. 56, no. 3, pp. 429–485, 2016, doi: 10.1080/15583724.2015.1107098.
- [15] A. N. B. Santos, D. J. dos Santos, and D. J. Carastan, “Microencapsulation of reactive isocyanates for application in self-healing materials: a review,” *Journal of Microencapsulation*, vol. 38, no. 5, pp. 338–356, 2021, doi: 10.1080/02652048.2021.1921068.
- [16] Y. K. Song, H. W. Kim, and C. M. Chung, “Repeatable Self-Healing of a Protective Coating Based on Vegetable-Oil-Loaded Microcapsules,” *Polymers*, vol. 14, no. 10, 2022, doi: 10.3390/polym14102013.
- [17] L. Ye, A. Jones, E. M. Fayyad, and M. A. S. A. Al-Maadeed, “Towards commercialization of self-healing technology in epoxy coatings,” 2015.
- [18] S. An, M. W. Lee, A. L. Yarin, and S. S. Yoon, “A review on corrosion-protective extrinsic self-healing: Comparison of microcapsule-based systems and those based on core-shell vascular networks,” *Chemical Engineering Journal*, vol. 344, pp. 206–220, 2018, doi: 10.1016/j.cej.2018.03.040.
- [19] S. Ataei, S. N. Khorasani, R. Torkaman, R. E. Neisiany, and M. S. Koochaki, “Self-healing performance of an epoxy coating containing microencapsulated alkyd resin based on coconut oil,” *Progress in Organic Coatings*, vol. 120, no. January, pp. 160–166, 2018, doi: 10.1016/j.porgcoat.2018.03.024.
- [20] Q. Wang, J. Cao, X. Liu, S. Yang, and M. Jiang, “Self-healing coatings for inhibiting corrosion of ferrous metals exposed to preservative-treated bamboo,” *Journal of Wood Science*, vol. 66, no. 1, 2020, doi: 10.1186/s10086-020-01865-4.
- [21] M. K. Mishra, *Applications of Encapsulation and Controlled Release*. 2019.

- [22] H. Wei *et al.*, “Advanced micro/nanocapsules for self-healing smart anticorrosion coatings,” *Journal of Materials Chemistry A*, vol. 3, no. 2, pp. 469–480, 2015, doi: 10.1039/c4ta04791e.
- [23] J. A. B. Valle, R. de C. S. C. Valle, A. C. K. Bierhalz, F. M. Bezerra, A. L. Hernandez, and M. J. Lis Arias, “Chitosan microcapsules: Methods of the production and use in the textile finishing,” *Journal of Applied Polymer Science*, vol. 138, no. 21, 2021, doi: 10.1002/app.50482.
- [24] A. M. Bakry *et al.*, “Microencapsulation of Oils: A Comprehensive Review of Benefits, Techniques, and Applications,” *Comprehensive Reviews in Food Science and Food Safety*, vol. 15, no. 1, pp. 143–182, 2016, doi: 10.1111/1541-4337.12179.
- [25] S. Jyothi Sri, A. Seethadevi, K. Suria Prabha, P. Muthuprasanna, and P. Pavitra, “Microencapsulation: A review,” *International Journal of Pharma and Bio Sciences*, vol. 3, no. 1, pp. P509–P531, 2012, doi: 10.56726/irjmets26546.
- [26] M. Tripathi, J. Rahamtullah, D. Kumar, C. Rajagopal, and P. Kumar Roy, “Influence of microcapsule shell material on the mechanical behavior of epoxy composites for self-healing applications,” *Journal of Applied Polymer Science*, vol. 131, no. 15, pp. 1–9, 2014, doi: 10.1002/app.40572.
- [27] R. K. Hedao, P. P. Mahulikar, and V. V. Gite, “Synthesis and Characterization of Resorcinol-Based Cross Linked Phenol Formaldehyde Microcapsules for Encapsulation of Pendimethalin,” *Polymer - Plastics Technology and Engineering*, vol. 52, no. 3, pp. 243–249, 2013, doi: 10.1080/03602559.2012.745555.
- [28] X. Yan, Y. Wang, H. Liu, R. Li, and C. Qian, “Synthesis and Characterization of Melamine-Formaldehyde Microcapsules Containing Pyraclostrobin by In situ Polymerization,” *Polymer Science - Series B*, vol. 60, no. 6, pp. 798–805, 2018, doi: 10.1134/S156009041806012X.
- [29] P. S. Shisode, C. B. Patil, and P. P. Mahulikar, “Preparation and Characterization of Microcapsules Containing Soybean Oil and Their Application in Self-Healing Anticorrosive Coatings,” *Polymer - Plastics Technology and Engineering*, vol. 57, no. 13, pp. 1334–1343, 2018, doi: 10.1080/03602559.2017.1381248.
- [30] M. Madelatparvar, M. S. Hosseini, and C. Zhang, “Polyurea micro-/nano-capsule applications in construction industry: A review,” *Nanotechnology Reviews*, vol. 12, no. 1, pp. 1–25, 2023, doi: 10.1515/ntrev-2022-0516.
- [31] P. D. Tatiya, R. K. Hedao, P. P. Mahulikar, and V. V. Gite, “Novel polyurea microcapsules using dendritic functional monomer: Synthesis, characterization, and its use in self-healing and anticorrosive polyurethane coatings,” *Industrial and Engineering Chemistry Research*, vol. 52, no. 4, pp. 1562–1570, 2013, doi: 10.1021/ie301813a.
- [32] N. Islam Khan, S. Halder, and M. Goyat, “Effect of Emulsifier on the Properties of Capsules for Fabricating Healing Enabled Next Generation Adhesive Joints,” no. July 2017, 2016.

- [33] B. Arab and A. Shokuhfar, “Molecular dynamics simulation of cross-linked urea-formaldehyde polymers for self-healing nanocomposites: Prediction of mechanical properties and glass transition temperature,” *Journal of Molecular Modeling*, vol. 19, no. 11, pp. 5053–5062, 2013, doi: 10.1007/s00894-013-1996-4.
- [34] A. Mitra, *Fundamentals of Quality Control and Improvement: Third Edition*. 2016. doi: 10.1002/9781118491645.
- [35] G. Kurt Çömlekçi and S. Ulutan, “Encapsulation of linseed oil and linseed oil based alkyd resin by urea formaldehyde shell for self-healing systems,” *Progress in Organic Coatings*, vol. 121, no. April, pp. 190–200, 2018, doi: 10.1016/j.porgcoat.2018.04.027.
- [36] C. Fan, J. Tang, and X. Zhou, “Role of ammonium chloride in preparing poly(urea-formaldehyde) microcapsules using one-step method,” *Journal of Applied Polymer Science*, vol. 129, no. 5, pp. 2848–2856, 2013, doi: 10.1002/app.39008.
- [37] M. Samadzadeh, S. H. Boura, M. Peikari, A. Ashrafi, and M. Kasiriha, “Tung oil: An autonomous repairing agent for self-healing epoxy coatings,” *Progress in Organic Coatings*, vol. 70, no. 4, pp. 383–387, 2011, doi: 10.1016/j.porgcoat.2010.08.017.
- [38] C. Suryanarayana, K. C. Rao, and D. Kumar, “Preparation and characterization of microcapsules containing linseed oil and its use in self-healing coatings,” *Progress in Organic Coatings*, vol. 63, no. 1, pp. 72–78, 2008, doi: 10.1016/j.porgcoat.2008.04.008.
- [39] M. Guo, Y. He, J. Wang, X. Zhang, and W. Li, “Microencapsulation of oil soluble polyaspartic acid ester and isophorone diisocyanate and their application in self-healing anticorrosive epoxy resin,” *Journal of Applied Polymer Science*, vol. 137, no. 12, pp. 1–14, 2020, doi: 10.1002/app.48478.
- [40] G. Wu, J. An, D. Sun, X. Tang, Y. Xiang, and J. Yang, “Robust microcapsules with polyurea/silica hybrid shell for one-part self-healing anticorrosion coatings,” *Journal of Materials Chemistry A*, vol. 2, no. 30, pp. 11614–11620, 2014, doi: 10.1039/c4ta01312c.
- [41] X. Ji *et al.*, “Developing wide pH-responsive, self-healing, and anti-corrosion epoxy composite coatings based on encapsulating oleic acid/2-mercaptopbenzimidazole corrosion inhibitors in chitosan/poly(vinyl alcohol) core-shell nanofibers,” *Progress in Organic Coatings*, vol. 161, no. November 2020, p. 106454, 2021, doi: 10.1016/j.porgcoat.2021.106454.
- [42] J. Jiang, X. Li, M. Du, X. Yang, and Y. Guo, “Linseed oil presents different patterns of oxidation in electrospun TA fibrous mats and TA aging assays,” vol. 11, no. 8, pp. 737–747, 2019, doi: 10.3920/QAS2018.1522.
- [43] Y. Orlova, R. E. Harmon, L. J. Broadbelt, and P. D. Iedema, “Review of the kinetics and simulations of linseed oil autoxidation,” *Progress in Organic Coatings*, vol. 151, no. September 2020, p. 106041, 2021, doi: 10.1016/j.porgcoat.2020.106041.

- [44] H. Wang and Q. Zhou, "Evaluation and failure analysis of linseed oil encapsulated self-healing anticorrosive coating," *Progress in Organic Coatings*, vol. 118, no. January, pp. 108–115, 2018, doi: 10.1016/j.porgcoat.2018.01.024.
- [45] M. De La Paz Miguel, R. Ollier, V. Alvarez, and C. Vallo, "Effect of the preparation method on the structure of linseed oil-filled poly(urea-formaldehyde) microcapsules," *Progress in Organic Coatings*, vol. 97, pp. 194–202, 2016, doi: 10.1016/j.porgcoat.2016.04.026.
- [46] L. Yuan, A. Gu, and G. Liang, "Preparation and properties of poly(urea-formaldehyde) microcapsules filled with epoxy resins," *Materials Chemistry and Physics*, vol. 110, no. 2–3, pp. 417–425, 2008, doi: 10.1016/j.matchemphys.2008.02.035.
- [47] K. Li *et al.*, "Dual-Functional Coatings with Self-Lubricating and Self-Healing Properties by Combining Poly(urea-formaldehyde)/SiO<sub>2</sub> Hybrid Microcapsules Containing Linseed Oil," *Industrial and Engineering Chemistry Research*, vol. 58, no. 48, pp. 22032–22039, 2019, doi: 10.1021/acs.iecr.9b04736.
- [48] S. Lang and Q. Zhou, "Synthesis and characterization of poly(urea-formaldehyde) microcapsules containing linseed oil for self-healing coating development," *Progress in Organic Coatings*, vol. 105, pp. 99–110, 2017, doi: 10.1016/j.porgcoat.2016.11.015.
- [49] A. Ebrahiminiya, M. Khorram, S. Hassanajili, and M. Javidi, "Modeling and optimization of the parameters affecting the in-situ microencapsulation process for producing epoxy-based self-healing anti-corrosion coatings," *Particuology*, vol. 36, pp. 59–69, 2018, doi: 10.1016/j.partic.2017.01.010.
- [50] R. P. Ollier, M. E. Penoff, and V. A. Alvarez, "Microencapsulation of epoxy resins: Optimization of synthesis conditions," *Colloids and Surfaces A: Physicochemical and Engineering Aspects*, vol. 511, pp. 27–38, 2016, doi: 10.1016/j.colsurfa.2016.09.081.
- [51] L. Yuan, G. Liang, J. Xie, L. Li, and J. Guo, "Preparation and characterization of poly ( urea-formaldehyde ) microcapsules filled with epoxy resins," vol. 47, pp. 5338–5349, 2006, doi: 10.1016/j.polymer.2006.05.051.
- [52] K. Thanawala, N. Mutneja, A. S. Khanna, and R. K. Singh Raman, "Development of self-healing coatings based on linseed oil as autonomous repairing agent for corrosion resistance," *Materials*, vol. 7, no. 11, pp. 7324–7338, 2014, doi: 10.3390/ma7117324.
- [53] W. Li, X. Zhu, N. Zhao, and Z. Jiang, "Preparation and properties of melamine urea-formaldehyde microcapsules for self-healing of cementitious materials," *Materials*, vol. 9, no. 3, 2016, doi: 10.3390/ma9030152.
- [54] E. Juliyanto, J. Rofingah, A. Finda, and F. N. Hakim, "Menentukan Tegangan Permukaan Zat Cair," *SPEKTRA : Jurnal Kajian Pendidikan Sains*, vol. 2, no. 2, pp. 176–186, 2016, doi: 10.32699/spektra.v2i2.18.

- [55] N. Shahabudin, R. Yahya, and S. N. Gan, “Microcapsules of Poly(urea-formaldehyde) (PUF) Containing alkyd from Palm Oil,” *Materials Today: Proceedings*, vol. 3, no. Icfmd 2015, pp. S88–S95, 2016, doi: 10.1016/j.matpr.2016.01.012.
- [56] R. I. D. Suyatmo, A. Topandi, L. O. Sari, and L. Nulhakim, “Pengaruh Penambahan Poli Vinil Alkohol (PVA) pada Enkapsulasi Minyak Kacang Kenari dalam Urea-Formaldehid untuk Aplikasi Self- Healing Coating,” *Jurnal Teknologi*, vol. 2, no. 2, pp. 173–183, 2023, doi: <https://doi.org/10.31479/jtek.v10i2.226>.
- [57] C. C. DeMerlis and D. R. Schoneker, “Review of the oral toxicity of polyvinyl alcohol (PVA),” *Food and Chemical Toxicology*, vol. 41, no. 3, pp. 319–326, 2003, doi: 10.1016/S0278-6915(02)00258-2.
- [58] D. J. S. A. Karunakaran, T. Ganesh, M. M. Sylvester, P. Senthilkumar, P. Hudge, and A. C. Kumbharkhane, “Dielectric Dispersion and Molecular Interaction in Polymer (PVA)-Surfactant (SDS) mixtures using picosecond time domain reflectometry,” *Journal of Molecular Liquids*, vol. 224, pp. 1199–1204, 2016, doi: 10.1016/j.molliq.2016.10.092.
- [59] T. Ivanković and J. Hrenović, “Surfactants in the environment,” *Arhiv za Higijenu Rada i Toksikologiju*, vol. 61, no. 1, pp. 95–110, 2010, doi: 10.2478/10004-1254-61-2010-1943.
- [60] H. Demissie and R. Duraisamy, “Effects of electrolytes on the surface and micellar characteristics of Sodium dodecyl sulphate surfactant solution,” *Journal of Scientific and Innovative Research*, vol. 5, no. 6, pp. 208–214, 2016, doi: 10.31254/jsir.2016.5603.
- [61] A. A. Sharipova *et al.*, “The use of polymer and surfactants for the microencapsulation and emulsion stabilization,” *Colloids and Interfaces*, vol. 1, no. 1, pp. 33–35, 2017, doi: 10.3390/colloids1010003.
- [62] H. E. Mohammadloo, S. M. Mirabedini, and H. Pezeshk-Fallah, “Microencapsulation of quinoline and cerium based inhibitors for smart coating application: Anti-corrosion, morphology and adhesion study,” *Progress in Organic Coatings*, vol. 137, no. June, p. 105339, 2019, doi: 10.1016/j.porgcoat.2019.105339.
- [63] S. M. Mirabedini, M. Esfandeh, R. R. Farnood, and P. Rajabi, “Amino-silane surface modification of urea-formaldehyde microcapsules containing linseed oil for improved epoxy matrix compatibility. Part I: Optimizing silane treatment conditions,” *Progress in Organic Coatings*, vol. 136, no. May, p. 105242, 2019, doi: 10.1016/j.porgcoat.2019.105242.
- [64] X. Fei *et al.*, “Microencapsulation mechanism and size control of fragrance microcapsules with melamine resin shell,” *Colloids and Surfaces A: Physicochemical and Engineering Aspects*, vol. 469, pp. 300–306, 2015, doi: 10.1016/j.colsurfa.2015.01.033.
- [65] B. H. Stuart, *Analytical Techniques in Materials Conservation*. 2007. doi: 10.1002/9780470060520.

- [66] X. Chen, B. Zheng, and H. Liu, “Optical and digital microscopic imaging techniques and applications in pathology,” *Analytical Cellular Pathology*, vol. 34, no. 1–2, pp. 5–18, 2011, doi: 10.3233/ACP-2011-0006.
- [67] A. F. Mohammed, A. F. Hamza, and A. E. Al-Kawaz, “Autonomous Self-Healing Coating of Pmma Microcapsules Filled With Epoxy,” *Diagnostyka*, vol. 23, no. 1, pp. 1–7, 2022, doi: 10.29354/diag/146692.
- [68] Y. K. Song and C. M. Chung, “Self-Healing Coating Healed With a Viscoelastic Substance,” *Icshm*, no. Figure 1, pp. 292–296, 2013.
- [69] M. Behzadnasab, M. Esfandeh, S. M. Mirabedini, and M. J. Zohuriaan-mehr, “Preparation and characterization of linseed oil-filled urea – formaldehyde microcapsules and their effect on mechanical properties of an epoxy-based coating,” *Colloids and Surfaces A: Physicochemical and Engineering Aspects*, vol. 457, pp. 16–26, 2014, doi: 10.1016/j.colsurfa.2014.05.033.
- [70] J. Jayanudin, R. Rochmadi, Moh. Fahrurrozi, and S. K. Wirawan, “Persamaan Empiris Sederhana untuk Memprediksi Ukuran Partikel dari Enkapsulasi Oleoresin Jahe Merah,” *ALCHEMY Jurnal Penelitian Kimia*, vol. 14, no. 2, p. 178, 2018, doi: 10.20961/alchemy.14.2.17076.178-192.
- [71] Y. Tiandho, “Analisis Kuantitatif Pori Berdasarkan Pengolahan Citra Menggunakan Wolfram Mathematica,” *Klik - Kumpulan Jurnal Ilmu Komputer*, vol. 4, no. 1, p. 15, 2017, doi: 10.20527/klik.v4i1.65.
- [72] Juita, B. Z. Dlugogorski, E. M. Kennedy, and J. C. Mackie, “Low temperature oxidation of linseed oil: a review,” *Fire Science Reviews*, vol. 1, no. 1, pp. 1–36, 2012, doi: 10.1186/2193-0414-1-3.