

DAFTAR PUSTAKA

1. Khosravan R, Grabowski BA, Wu JT, Joseph-Ridge N, Vernillet L. Pharmacokinetics, Pharmacodynamics and Safety of Febuxostat, a Non-Purine Selective Inhibitor of Xanthine Oxidase, in a Dose Escalation Study in Healthy Subjects. Vol. 45, Clin Pharmacokinet. 2006.
2. Bisht M, Bist SS. Febuxostat: A Novel Agent for Management of Hyperuricemia in Gout. Indian J Pharm Sci [Internet]. 2011 Dec;597–600.
3. Reinders MK, Th TL, Jansen A. Clinical Interventions in Aging Management of hyperuricemia in gout: focus on febuxostat [Internet]. Clinical Interventions in Aging. 2010.
4. Yin YF, Guo Y, Song WD, Duan XC, Zheng XC, Zhong T, et al. Improving Solubility and Oral Bioavailability of Febuxostat by Polymer-Coated Nanomatrix. AAPS PharmSciTech. 2018 Feb 1;19(2):934–40.
5. Kamel B. The clinical pharmacokinetics and pharmacodynamics of febuxostat [Internet]. [Sydney]: University of New South Wales Australia; 2018.
6. Bhalani D V., Nutan B, Kumar A, Singh Chandel AK. Bioavailability Enhancement Techniques for Poorly Aqueous Soluble Drugs and Therapeutics. Vol. 10, Biomedicines. MDPI; 2022.
7. Shelke PS, U W, RK S, Pawar TB, Bhingar HR, Narode PA. A review on solubility enhancement technique. Int J Pharm Pharm Sci. 2024 Jan 1;6(1):144–8.
8. Kanikkannan N. Technologies to Improve the Solubility, Dissolution and Bioavailability of Poorly Soluble Drugs. J Anal Pharm Res. 2018 Feb 1;7(1).
9. Tang J, Bao J, Shi X, Sheng X, Su W. Preparation, optimization, and in vitro–in vivo evaluation of febuxostat ternary solid dispersion. J Microencapsul. 2018 Jul 4;35(5):454–66.
10. Rangaraj N, Shah S, Maruthi AJ, Pailla SR, Cheruvu HS, Sujatha D, et al. Quality by Design Approach for the Development of Self-Emulsifying Systems for Oral Delivery of Febuxostat: Pharmacokinetic and Pharmacodynamic Evaluation. AAPS PharmSciTech. 2019 Oct 1;20(7).
11. Gao L, Zhang X. Cocrystallization of Febuxostat with Pyridine Coformers: Crystal Structural and Physicochemical Properties Analysis. J Chem. 2021;2021.
12. Kumar Bandaru R, Rout SR, Kenguva G, Gorain B, Alhakamy NA, Kesharwani P, et al. Recent Advances in Pharmaceutical Cocrystals: From Bench to Market. Vol. 12, Frontiers in Pharmacology. Frontiers Media S.A.; 2021.

13. Hong S, Shen S, Tan DCT, Ng WK, Liu X, Chia LSO, et al. High drug load, stable, manufacturable and bioavailable fenofibrate formulations in mesoporous silica: A comparison of spray drying versus solvent impregnation methods. *Drug Deliv*. 2016 Jan 2;23(1):316–27.
14. Kamarudin NHN, Jalil AA, Triwahyono S, Salleh NFM, Karim AH, Mukti RR, et al. Role of 3-aminopropyltriethoxysilane in the preparation of mesoporous silica nanoparticles for ibuprofen delivery: Effect on physicochemical properties. *Microporous Mesoporous Mater*. 2013;180:235–41.
15. Song SW, Hidajat K, Kawi S. Functionalized SBA-15 materials as carriers for controlled drug delivery: Influence of surface properties on matrix-drug interactions. *Langmuir*. 2005 Oct 11;21(21):9568–75.
16. Zhao D, Feng J, Huo Q, Melosh N, Fredrickson GH, Chmelka BF, et al. Triblock Copolymer Syntheses of Mesoporous Silica with Periodic 50 to 300 Angstrom Pores. *Science* (80-) [Internet]. 1998 Jan 23;279(5350):548–52.
17. Möller K, Bein T. Mesoporosity – a new dimension for zeolites. *Chem Soc Rev*. 2013 Apr 15;42(9):3689–707.
18. Wang H, Gao X, Wang Y, Wang J, Niu X, Deng X. Effect of amine functionalization of SBA-15 on controlled baicalin drug release. *Ceram Int*. 2012 Dec;38(8):6931–5.
19. Ministry of Health and Welfare. The Japanese Pharmacopoeia. 18th ed. Tokyo: The Minister of Health, Labour and Welfare; 2021.
20. Haq N, Alghaith AF, Alshehri S, Shakeel F. Solubility and Thermodynamic Data of Febuxostat in Various Mono Solvents at Different Temperatures. *Molecules*. 2022 Jul 1;27(13).
21. Mayer MD, Khosravan R, Vernillet L, Wu JT, Joseph-Ridge N, Mulford DJ. Pharmacokinetics and Pharmacodynamics of Febuxostat, a New Non-purine Selective Inhibitor of Xanthine Oxidase in Subjects with Renal Impairment. *Am J Ther*. 2005;22–34.
22. Pandey A, Chaturvedi M, Prakash H, Meena D. Febuxostat-A New Treatment for Hyperuricaemia in Gout-A Review Article. Vol. 2, *National Journal of Physiology, Pharmacy & Pharmacology*. 2012.
23. Ariga K, Vinu A, Yamauchi Y, Ji Q, Hill JP. Nanoarchitectonics for mesoporous materials. *Bull Chem Soc Jpn*. 2012;85(1):1–32.
24. Chaudhary V, Sharma S. An overview of ordered mesoporous material SBA-15: synthesis, functionalization and application in oxidation reactions. *J Porous Mater*. 2017 Jun 1;24(3):741–9.
25. Khan AJ, Song J, Ahmed K, Rahim A, Onófrio Volpe PL, Rehman F. Mesoporous silica MCM-41, SBA-15 and derived bridged polysilsesquioxane SBA-PMDA for the selective removal of textile reactive dyes from wastewater. *J Mol Liq*. 2020 Jan 15;298.

26. Liu X, Che S. Enhanced release of the poorly soluble drug itraconazole loaded in ordered mesoporous silica. *Sci China Chem.* 2015;58(3):400–10.
27. Maleki A, Kettiger H, Schoubben A, Rosenholm JM, Ambrogi V, Hamidi M. Mesoporous silica materials: From physico-chemical properties to enhanced dissolution of poorly water-soluble drugs. Vol. 262, *Journal of Controlled Release.* Elsevier B.V.; 2017. p. 329–47.
28. Hartono SB, Hadidoewignyo L. *Pembuatan dan Pemanfaatan Silika Mesopori.* Universitas Katolik Widya Mandala Surabaya; 2017.
29. Vazquez NI, Gonzalez Z, Ferrari B, Castro Y. Synthesis of mesoporous silica nanoparticles by sol-gel as nanocontainer for future drug delivery applications. *Bol la Soc Esp Ceram y Vidr.* 2017 May 1;56(3):139–45.
30. Ijaz A, Yagci MB, Ow-Yang CW, Demirel AL, Mikó A. Formation of mesoporous silica particles with hierarchical morphology. *Microporous Mesoporous Mater.* 2020 Aug 15;303.
31. Li X, Yin H, Zhang J, Liu J, Chen G. Effect of organic template removal approaches on physiochemical characterization of Ni/Al-SBA-15 and eugenol hydrodeoxygenation. *J Solid State Chem.* 2020 Feb 1;282.
32. Walcarius A. Mesoporous materials and electrochemistry. *Chem Soc Rev.* 2013 Apr 15;42(9):4098–140.
33. Guo Z, Liu XM, Ma L, Li J, Zhang H, Gao YP, et al. Effects of particle morphology, pore size and surface coating of mesoporous silica on Naproxen dissolution rate enhancement. *Colloids Surfaces B Biointerfaces.* 2013 Jan 1;101:228–35.
34. Fitriani L, Azizah H, Hasanah U, Zaini E. Enhancement of Curcumin Solubility and Dissolution By Adsorption in Mesoporous Sba-15. *Int J Appl Pharm.* 2023;15(Special Issue 1):61–7.
35. Rizky F. *Peningkatan Kelarutan dan Disolusi Tikagrelor dalam Mesopori SBA-15.* Padang; 2024.
36. Esperanza Adrover M, Pedernera M, Bonne M, Lebeau B, Bucalá V, Gallo L. Synthesis and characterization of mesoporous SBA-15 and SBA-16 as carriers to improve albendazole dissolution rate. *Saudi Pharm J [Internet].* 2020;28(1):15–24.
37. Zhao D, Huo Q, Feng J, Chmelka BF, Stucky GD. Nonionic Triblock and Star Diblock Copolymer and Oligomeric Surfactant Syntheses of Highly Ordered, Hydrothermally Stable, Mesoporous Silica Structures. *J Am Chem Soc.* 1998;120(24):6024–36.
38. Dhaneswara D, Sofyan N. Effect of different pluronic p123 triblock copolymer surfactant concentrations on SBA-15 pore formation. *Int J Technol.* 2016;7(6):1009–15.
39. Dhaneswara D, Siti Agustina AAA, Dewantoro Adhy P, Delayori F, Fatriansyah JF. The Effect of Pluronic 123 Surfactant concentration on the

- N₂ Adsorption Capacity of Mesoporous Silica SBA-15: Dubinin-Astakhov Adsorption Isotherm Analysis. In: Journal of Physics: Conference Series. Institute of Physics Publishing; 2018.
40. Thahir R, Wahab AW, Nafie N La, Raya I. Synthesis of high surface area mesoporous silica SBA-15 by adjusting hydrothermal treatment time and the amount of polyvinyl alcohol. *Open Chem*. 2019 Jan 1;17(1):963–71.
 41. Yoga W, Hendriani R. Review: Teknik Peningkatan Kelarutan Obat. *Farmaka*. 2013;14:288–98.
 42. National Center for Biotechnology Information. Tetraethyl orthosilicate [Internet]. PubChem Compound Summary for CID 6517. 2024 [cited 2024 Sep 26].
 43. Capela P, Costa S, Souza MS, Carvalho S, Pereira M, Carvalho L, et al. Wear behavior of a new composite formulation, with TEOS addition, for abrasive vitrified grinding wheels. *Wear*. 2023 Jan 15;512–513:204524.
 44. Mise Y, Ahn SJ, Takagaki A, Kikuchi R, Oyama ST. Fabrication and evaluation of trimethylmethoxysilane (TMMOS)-derived membranes for gas separation. *Membranes (Basel)*. 2019 Oct 1;9(10).
 45. Bramanti E, Bonaccorsi L, Campanella B, Ferrari C, Malara A, Freni A. Structural characterization of electrospun tetraethylortosilicate (TEOS)/Polyvinylpyrrolidone (PVP) microfibres. *Mater Chem Phys* [Internet]. 2022 Aug 1 [cited 2024 Sep 26];287:126248.
 46. Fares AR, Elmeshad AN, Kassem MAA. Enhancement of dissolution and oral bioavailability of lacidipine via pluronic P123/F127 mixed polymeric micelles: Formulation, optimization using central composite design and in vivo bioavailability study. *Drug Deliv*. 2018;25(1):132–42.
 47. de Castro KC, Coco JC, dos Santos ÉM, Ataíde JA, Martinez RM, do Nascimento MHM, et al. Pluronic® triblock copolymer-based nanoformulations for cancer therapy: A 10-year overview. *J Control Release*. 2023 Jan 1;353:802–22.
 48. Banerjee S, Omlor A, Wolny JA, Han Y, Lermyte F, Godfrey AE, et al. Generation of maghemite nanocrystals from iron-sulfur centres. *Dalt Trans*. 2019;48(26):9564–9.
 49. Figueroa-Ochoa EB, Bravo-Anaya LM, Vaca-López R, Landázuri-Gómez G, Rosales-Rivera LC, Diaz-Vidal T, et al. Structural Behavior of Amphiphilic Triblock Copolymer P104/Water System. *Polymers (Basel)*. 2023 Jun 1;15(11).
 50. Singla P, Garg S, McClements J, Jamieson O, Peeters M, Mahajan RK. Advances in the therapeutic delivery and applications of functionalized Pluronic: A critical review. *Adv Colloid Interface Sci*. 2022 Jan 1;299:102563.
 51. Doadrio AL, Sousa EMB, Doadrio JC, Pérez Pariente J, Izquierdo-Barba I,

- Vallet-Regí M. Mesoporous SBA-15 HPLC evaluation for controlled gentamicin drug delivery. *J Control Release*. 2004 May 31;97(1):125–32.
52. Xue JM, Shi M. PLGA/mesoporous silica hybrid structure for controlled drug release. *J Control Release*. 2004 Aug 11;98(2):209–17.
53. Kim MS, Jeon JB, Chang JY. Selectively functionalized mesoporous silica particles with the PEGylated outer surface and the doxorubicin-grafted inner surface: Improvement of loading content and solubility. *Microporous Mesoporous Mater*. 2013;172:118–24.
54. Möller K, Bein T. Talented mesoporous silica nanoparticles. *Chem Mater*. 2017 Jan 10;29(1):371–88.
55. Estevão BM, Miletto I, Hioka N, Marchese L, Gianotti E. Mesoporous Silica Nanoparticles Functionalized with Amino Groups for Biomedical Applications. *ChemistryOpen*. 2021;10(12):1251–9.
56. Kureshy RI, Ahmad I, Pathak K, Khan NH, Abdi SHR, Jasra R V. Sulfonic acid functionalized mesoporous SBA-15 as an efficient and recyclable catalyst for the synthesis of chromenes from chromanols. *Catal Commun*. 2009 Jan 25;10(5):572–5.
57. Luan Z, Fournier JA, Wooten JB, Miser DE. Preparation and characterization of (3-aminopropyl) triethoxysilane-modified mesoporous SBA-15 silica molecular sieves. *Microporous Mesoporous Mater*. 2005 Sep 1;83(1–3):150–8.
58. Zeng W, Qian XF, Yin J, Zhu ZK. The drug delivery system of MCM-41 materials via co-condensation synthesis. *Mater Chem Phys*. 2006 Jun 10;97(2–3):437–41.
59. Tang Q, Xu Y, Wu D, Sun Y. A study of carboxylic-modified mesoporous silica in controlled delivery for drug famotidine. *J Solid State Chem*. 2006 May;179(5):1513–20.
60. Gisbert-Garzarán M, Manzano M, Vallet-Regí M. pH-responsive mesoporous silica and carbon nanoparticles for drug delivery. Vol. 4, *Bioengineering*. MDPI AG; 2017.
61. Liu X, Yue Z, Romeo T, Weber J, Scheuermann T, Moulton S, et al. Biofunctionalized anti-corrosive silane coatings for magnesium alloys. *Acta Biomater*. 2013;9(10):8671–7.
62. Marques ME, Mansur AAP, Mansur HS. Chemical functionalization of surfaces for building three-dimensional engineered biosensors. In: *Applied Surface Science*. Elsevier B.V.; 2013. p. 347–60.
63. Gutiérrez Moreno JJ, Pan K, Wang Y, Li W. Computational Study of APTES Surface Functionalization of Diatom-like Amorphous SiO₂ Surfaces for Heavy Metal Adsorption. *Langmuir*. 2020 May 26;36(20):5680–9.
64. de O. N. Ribeiro J, Nunes EHM, Vasconcelos DCL, Vasconcelos WL, Nascimento JF, Grava WM, et al. Role of the type of grafting solvent and its

removal process on APTES functionalization onto SBA-15 silica for CO₂ adsorption. *J Porous Mater.* 2019 Dec 1;26(6):1581–91.

65. Isasi J, Arévalo P, Martin E, Martín-Hernández F. Preparation and study of silica and APTES–silica-modified NiFe₂O₄ nanocomposites for removal of Cu²⁺ and Zn²⁺ ions from aqueous solutions. *J Sol-Gel Sci Technol.* 2019 Sep 15;91(3):596–610.
66. United States Pharmacopoeial Convention. *United States Pharmacopeia.* 43rd ed. New York: United States Pharmacopoeial Convention Inc; 2017.
67. Zhou QT, Leung SSY, Tang P, Parumasivam T, Loh ZH, Chan HK. Inhaled formulations and pulmonary drug delivery systems for respiratory infections. Vol. 85, *Advanced Drug Delivery Reviews.* Elsevier B.V.; 2015. p. 83–99.
68. Bermejo M, Sanchez-Dengra B, Gonzalez-Alvarez M, Gonzalez-Alvarez I. Oral controlled release dosage forms: dissolution versus diffusion. Vol. 17, *Expert Opinion on Drug Delivery.* Taylor and Francis Ltd; 2020. p. 791–803.
69. Hillery AM, Park K. *Drug Delivery: Fundamentals & Applications.* 2nd ed. New York: CRC Press; 2017.
70. Hardenia A, Maheshwari N, Hardenia SS, Dwivedi SK, Maheshwari R, Tekade RK. Scientific rationale for designing controlled drug delivery systems. In: *Basic Fundamentals of Drug Delivery.* Elsevier; 2018. p. 1–28.
71. Rismana E, Rosidah I, Bunga O, Yunianto P, Pusat E, Farmasi T, et al. Pengujian Stabilitas Sediaan Luka Bakar Berbahan Baku Aktif Kitosan/Ekstrak Pegagan (*Centella asiatica*). Vol. 17. 2015.
72. Sinha P, Datar A, Jeong C, Deng X, Chung YG, Lin LC. Surface Area Determination of Porous Materials Using the Brunauer-Emmett-Teller (BET) Method: Limitations and Improvements. *J Phys Chem C.* 2019 Aug 22;123(33):20195–209.
73. Naderi M. Surface Area: Brunauer-Emmett-Teller (BET). In: *Progress in Filtration and Separation.* Elsevier Ltd; 2015. p. 585–608.
74. Nandiyanto ABD, Oktiani R, Ragadhita R. How to read and interpret ftir spectroscopy of organic material. *Indones J Sci Technol.* 2019;4(1):97–118.
75. Balan V, Mihai CT, Cojocaru FD, Uritu CM, Dodi G, Botezat D, et al. Vibrational spectroscopy fingerprinting in medicine: From molecular to clinical practice. Vol. 12, *Materials.* MDPI AG; 2019.
76. Sen RK, Karthikeyan K, Prabhakar P, Vishwakarma J, Gupta G, Mishra SN, et al. Fast tracking of adulterants and bacterial contamination in food via Raman and infrared spectroscopies: Paving the way for a healthy and safe world. Vol. 1, *Sensors and Diagnostics.* Royal Society of Chemistry; 2022. p. 673–85.
77. Munajad A, Subroto C, Suwarno. Fourier transform infrared (FTIR) spectroscopy analysis of transformer paper in mineral oil-paper composite insulation under accelerated thermal aging. *Energies.* 2018 Feb 1;11(2).

78. Bunaciu AA, Udriștioiu E gabriela, Aboul-Enein HY. X-Ray Diffraction: Instrumentation and Applications. Vol. 45, Critical Reviews in Analytical Chemistry. Taylor and Francis Ltd.; 2015. p. 289–99.
79. Setiabudi A, Hardian R, Mudzakir A. Karakterisasi Material: Prinsip dan Aplikasinya dalam Penelitian Kimia. Bandung: UPI Press; 2012.
80. Baird JA, Taylor LS. Evaluation of amorphous solid dispersion properties using thermal analysis techniques. Vol. 64, Advanced Drug Delivery Reviews. 2012. p. 396–421.
81. Hildal K, Perepezko JH. Metals and Alloys. In: Handbook of Thermal Analysis and Calorimetry. Elsevier B.V.; 2018. p. 781–828.
82. Brown ME. Introduction to Thermal Analysis: Techniques and Applications. Second. Kluwer Academic Publishers; 2004.
83. Chirayil CJ, Abraham J, Mishra RK, George SC, Thomas S. Instrumental Techniques for the Characterization of Nanoparticles. In: Thermal and Rheological Measurement Techniques for Nanomaterials Characterization. Elsevier; 2017. p. 1–36.
84. Dachriyanus. Analisis Struktur Senyawa Organik Secara Spektroskopi. Padang: LPTIK Universitas Andalas; 2004.
85. Suhartati T. Dasar-Dasar Spektrofotometri UV-Vis dan Spektrometri Massa untuk Penentuan Struktur Senyawa Organik. Bandar Lampung: AURA (Anugrah Utama Raharja); 2017.
86. Hasanah U, Wikarsa S, Asyarie S. Various Chloride Salt Addition in Mesoporous Material (SBA-15) Synthesis and Potential as Carrier for Dissolution Enhancer. 2021.
87. Liou TH, Chen GW, Yang S. Preparation of Amino-Functionalized Mesoporous SBA-15 Nanoparticles and the Improved Adsorption of Tannic Acid in Wastewater. *Nanomaterials*. 2022;12(5).
88. Octaviani S. Sintesis dan Karakterisasi Zeolit ZSM-5 Mesopori dengan Metode Desilikasi dan Studi Awal Katalisis Oksidasi Metana [Internet]. [Depok]: Universitas Indonesia; 2012 [cited 2024 Nov 12].
89. Depkes RI. Farmakope Indonesia Edisi VI. Departemen Kesehatan Republik Indonesia. Jakarta: Kementerian Kesehatan RI; 2020.
90. Agency EM. International Conference on Harmonization of Note for Guidance on Validation of Analytical Procedures: Text and Methodology. In: Step 5 of the ICH Process. London; 1994. p. 1–15.
91. Harmita. Petunjuk Pelaksanaan Validasi dan Cara Penggunaannya. *Maj Ilmu Kefarmasian*. 2004;1(3):117–35.
92. Supraba W, Juliantoni Y, Ananto AD. The Effect of Stirring Speeds to the Entrapment Efficiency in a Nanoparticles Formulation of Java Plum's seed Ethanol Extract (*Syzygium cumini*). *Acta Chim Asiana*. 2021;4(1):197–103.

93. Shen SC, Ng WK, Chia L, Dong YC, Tan RBH. Stabilized Amorphous State of Ibuprofen by Co-Spray Drying With Mesoporous SBA-15 to Enhance Dissolution Properties. *J Pharm Sci.* 2010 Apr 1;99(4):1997–2007.
94. Maleki A, Hamidi M. Dissolution enhancement of a model poorly water-soluble drug, atorvastatin, with ordered mesoporous silica: Comparison of MSF with SBA-15 as drug carriers. *Expert Opin Drug Deliv.* 2016;13(2):171–81.
95. Hidayani E, Andriyani A, Taufik M. Functionalization Mesoporous Silica using Aminopropyltriethoxysilane (APTES) as Adsorbent for Removal Ni (II) from Aqueous Solution. *JKPK (Jurnal Kim dan Pendidik Kim.* 2024 Apr 3;9(1):115.
96. Ghodake MSR, Tarkase AS, Chavan VN, Kale AD, Bhosale SP, Ghadge PS, et al. Preparation and Evaluation of Solid Dispersion of Febuxostat For Solubility Enhancement. *J Popul Ther Clin Pharmacol [Internet].* 2022 Oct 16;29(04):4408–29.

