

REFERENCES

- Agrawal, R., & Gupta, V. (2012). Cyclodextrins – A Review on Pharmaceutical Application for Drug Delivery. *International Journal of Pharmaceutical Frontier Research*, 2(1), 95–112.
- Amidon, G. L., Lennernäs, H., Shah, V. P., & Crison, J. R. (1995). A theoretical basis for a biopharmaceutic drug classification: the correlation of in vitro drug product dissolution and in vivo bioavailability. *Pharmaceutical Research*, 12(3), 413–420. <https://doi.org/10.1023/a:1016212804288>
- Banchero, M. (2021). Supercritical Carbon Dioxide as a Green Alternative to Achieve Drug Complexation with Cyclodextrins. *Pharmaceuticals*, 14(6), 562. <https://doi.org/10.3390/ph14060562>
- Bani-Yaseen, A. D., & Mo'ala, A. (2014). Spectral, thermal, and molecular modeling studies on the encapsulation of selected sulfonamide drugs in β -cyclodextrin nano-cavity. *Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy*, 131, 424–431. <https://doi.org/10.1016/j.saa.2014.04.136>
- Béjaoui, I., Baâzaoui, M., Chevalier, Y., Amdouni, N., Kalfat, R., & Hbaieb, S. (2017). Influence of the substituted β -cyclodextrins by amino groups on the complexation of antifungal drug. *Journal of Tunisian Chemical Society*, 19, 178–186.
- Bienvenu, C., Martínez, Á., Jiménez Blanco, J. L., Di Giorgio, C., Vierling, P., Ortiz Mellet, C., Defaye, J., & García Fernández, J. M. (2012). Polycationic amphiphilic cyclodextrins as gene vectors: effect of the macrocyclic ring size on the DNA complexing and delivery properties. *Organic & Biomolecular Chemistry*, 10(29), 5570. <https://doi.org/10.1039/c2ob25786f>
- Bonnet, V., Duval, R., Tran, V., & Rabiller, C. (2003). Mono-N-glycosidation of β -Cyclodextrin - Synthesis of 6-(β -Cyclodextrinyl-amino)-6-deoxy-D-galactosides and of N-(6-Deoxy- β -cyclodextrinyl)-galacto-azepane. *European Journal of Organic Chemistry*, 2003(24), 4810–4818. <https://doi.org/10.1002/ejoc.200300449>
- Brady, B., Lynam, N., O'Sullivan, T., Ahern, C., & Darcy, R. (2000). 6^A-O-*p*-Toluenesulfonyl- β -Cyclodextrin. *Organic Syntheses*, 77, 220. <https://doi.org/10.15227/orgsyn.077.0220>
- Brown, S., Coates, J., Coghlan, D., Easton, C., Vaneyk, S., Janowski, W., Lepore, A., Lincoln, S., Luo, Y., May, B., Schiesser, D., Wang, P., & Williams, M. (1993). Synthesis and Properties of 6A-Amino-6A-deoxy- α and β -cyclodextrin. *Australian Journal of Chemistry*, 46(6), 953. <https://doi.org/10.1071/CH9930953>
- Byun, H.-S., Zhong, N., & Bittman, R. (2000). 6^A-O-*p*-Toluenesulfonyl- β -

- Cyclodextrin. *Organic Syntheses*, 77, 225.
<https://doi.org/10.15227/orgsyn.077.0225>
- Çelik, S. E., Özyürek, M., Güçlü, K., & Apak, R. (2015). Antioxidant capacity of quercetin and its glycosides in the presence of β -cyclodextrins: influence of glycosylation on inclusion complexation. *Journal of Inclusion Phenomena and Macrocyclic Chemistry*, 83(3–4), 309–319.
<https://doi.org/10.1007/s10847-015-0566-z>
- Chen, H., Shu, J., Li, P., Chen, B., Li, N., & Li, L. (2014). Application of Coating Chitosan Film-forming Solution Combined β -CD-Citral Inclusion Complex on Beef Fillet. *Journal of Food and Nutrition Research*, 2(10), 692–697.
<https://doi.org/10.12691/jfnr-2-10-7>
- Cheng, Y., Jiang, P., & Dong, X. (2015). Molecularly imprinted fluorescent chemosensor synthesized using quinoline-modified- β -cyclodextrin as monomer for spermidine recognition. *RSC Advances*, 5(68), 55066–55074.
<https://doi.org/10.1039/C5RA07761C>
- Coleman, A. W., Nicolis, I., Keller, N., & Dalbiez, J. P. (1992). Aggregation of cyclodextrins: An explanation of the abnormal solubility of beta-cyclodextrin. *Journal of Inclusion Phenomena and Molecular Recognition in Chemistry*, 13(2), 139–143. <https://doi.org/10.1007/BF01053637>
- Crini, G. (2014). Review: A history of cyclodextrins. *Chemical Reviews*, 114(21), 10940–10975. <https://doi.org/10.1021/cr500081p>
- Crini, G., Fourmentin, S., Fenyvesi, É., Torri, G., Fourmentin, M., & Morin-Crini, N. (2018). *Fundamentals and Applications of Cyclodextrins* (S. Fourmentin, G. Crini, & E. Lichtfouse (eds.); pp. 1–55). Springer International Publishing.
https://doi.org/10.1007/978-3-319-76159-6_1
- Cryan, S. A., Donohue, R., Ravoo, B. J., Darcy, R., & O'Driscoll, C. M. (2004). Cationic cyclodextrin amphiphiles as gene delivery vectors. *Journal of Drug Delivery Science and Technology*, 14(1), 57–62.
[https://doi.org/10.1016/S1773-2247\(04\)50006-0](https://doi.org/10.1016/S1773-2247(04)50006-0)
- Del Valle, E. M. M. (2004). Cyclodextrins and their uses: A review. *Process Biochemistry*, 39(9), 1033–1046. [https://doi.org/10.1016/S0032-9592\(03\)00258-9](https://doi.org/10.1016/S0032-9592(03)00258-9)
- Deng, S., Liu, H., Qi, C., Yang, A., & Li, Z. (2018). Study on preparation and inclusion behavior of inclusion complexes between β -cyclodextrin derivatives with benzophenone. *Journal of Inclusion Phenomena and Macrocyclic Chemistry*, 90(3–4), 321–329. <https://doi.org/10.1007/s10847-018-0787-z>
- Dimakos, V., & Taylor, M. S. (2018). Site-Selective Functionalization of Hydroxyl Groups in Carbohydrate Derivatives. *Chemical Reviews*, 118(23), 11457–11517. <https://doi.org/10.1021/acs.chemrev.8b00442>

- Dong, C., Li, C., Xiao, H., He, B., & Qian, L. (2014). β -Cyclodextrin Grafted Cellulose and Cationic Starch for Antibacterial Paper Products: A Comparative Study. *BioResources*, 9(2). <https://doi.org/10.15376/biores.9.2.3580-3590>
- Easton, C. J., & Lincoln, S. F. (1999). *Modified Cyclodextrins*. Imperial College Press. <https://doi.org/10.1142/p124>
- Frömming, K.-H., & Szejtli, J. (1994). *Cyclodextrins in Pharmacy* (Vol. 5). Springer Netherlands. <https://doi.org/10.1007/978-94-015-8277-3>
- Gidwani, B., & Vyas, A. (2015). A Comprehensive Review on Cyclodextrin-Based Carriers for Delivery of Chemotherapeutic Cytotoxic Anticancer Drugs. *BioMed Research International*, 2015, 1–15. <https://doi.org/10.1155/2015/198268>
- Havlikova, M., Bosakova, Z., Benkovic, G., Jindrich, J., Popr, M., & Coufal, P. (2016). Use of 6-O-mono-substituted derivatives of β -cyclodextrin-bearing substituent with two permanent positive charges in capillary electrophoresis. *Chemical Papers*, 70(9). <https://doi.org/10.1515/chempap-2016-0053>
- Joshi, D. R., & Adhikari, N. (2019). Phase Transfer Catalyst in Organic Synthesis. *World Journal of Pharmaceutical Research*, 8(8), 508–515. <https://doi.org/10.20959/wjpps20198-15348>
- Karande, P., & Mitragotri, S. (2009). Enhancement of transdermal drug delivery via synergistic action of chemicals. *Biochimica et Biophysica Acta - Biomembranes*, 1788(11), 2362–2373. <https://doi.org/10.1016/j.bbamem.2009.08.015>
- Kasal, P., & Jindřich, J. (2021). Mono-6-Substituted Cyclodextrins—Synthesis and Applications. *Molecules*, 26(16), 5065. <https://doi.org/10.3390/molecules26165065>
- Khan, A. R., Forgo, P., Stine, K. J., & D'Souza, V. T. (1998). Methods for Selective Modifications of Cyclodextrins. *Chemical Reviews*, 98(5), 1977–1996. <https://doi.org/10.1021/cr970012b>
- Kim, J.-S. (2020). Synthesis and Characterization of Phenolic Acid/Hydroxypropyl- β -Cyclodextrin Inclusion Complexes. *Preventive Nutrition and Food Science*, 25(4), 440–448. <https://doi.org/10.3746/pnf.2020.25.4.440>
- Köhn, M., & Breinbauer, R. (2004). The Staudinger Ligation—A Gift to Chemical Biology. *Angewandte Chemie International Edition*, 43(24), 3106–3116. <https://doi.org/10.1002/anie.200401744>
- Ku, M. S., & Dulin, W. (2012). A biopharmaceutical classification-based Right-First-Time formulation approach to reduce human pharmacokinetic variability and project cycle time from First-In-Human to clinical Proof-Of-Concept.

Pharmaceutical Development and Technology, 17(3), 285–302.
<https://doi.org/10.3109/10837450.2010.535826>

- Law, H., Benito, J. M., García Fernández, J. M., Jicsinszky, L., Crouzy, S., & Defaye, J. (2011). Copper(II)-Complex Directed Regioselective Mono- p - Toluenesulfonylation of Cyclomaltoheptaose at a Primary Hydroxyl Group Position: An NMR and Molecular Dynamics-Aided Design. *The Journal of Physical Chemistry B*, 115(23), 7524–7532.
<https://doi.org/10.1021/jp2035345>
- Lee, T., Lim, J., Chung, I., Kim, I., & Ha, C.-S. (2010). Preparation and characterization of polyimide/modified β -cyclodextrin nanocomposite films. *Macromolecular Research*, 18(2), 120–128. <https://doi.org/10.1007/s13233-009-0120-1>
- Liu, X.-M., Lee, H.-T., Reinhardt, R. A., Marky, L. A., & Wang, D. (2007). Novel biomineral-binding cyclodextrins for controlled drug delivery in the oral cavity. *Journal of Controlled Release*, 122(1), 54–62.
<https://doi.org/10.1016/j.jconrel.2007.06.021>
- Loftsson, T. (2002). Cyclodextrins and the Biopharmaceutics Classification System of Drugs. *Journal of Inclusion Phenomena and Macrocyclic Chemistry*, 44(1), 63–67. <https://doi.org/10.1023/A:1023088423667>
- Loftsson, T., & Duchene, D. (2007). Cyclodextrins and their pharmaceutical applications. *International Journal of Pharmaceutics*, 329(1–2), 1–11.
<https://doi.org/10.1016/j.ijpharm.2006.10.044>
- Manouilidou, M. D., Lazarou, Y. G., Mavridis, I. M., & Yannakopoulou, K. (2014). Staudinger ligation towards cyclodextrin dimers in aqueous/organic media. Synthesis, conformations and guest-encapsulation ability. *Beilstein Journal of Organic Chemistry*, 10, 774–783. <https://doi.org/10.3762/bjoc.10.73>
- Muderawan, I. (2021). *Pembuatan Alkana dan Arenasulfonilimidazol dengan Katalis Transfer Fasa* (Patent No. Aplikasi Paten. Nomor Permohonan S00202102290 dan Nomor Publikasi 2021/SID/01397).
- Muderawan, I. W., Ong, T.-T., Tang, W., Young, D. J., Ching, C.-B., & Ng, S.-C. (2005a). Synthesis of ammonium substituted β -cyclodextrins for enantioseparation of anionic analytes. *Tetrahedron Letters*, 46(10), 1747–1749. <https://doi.org/10.1016/j.tetlet.2005.01.059>
- Muderawan, I. W., Ong, T. T., Lee, T. C., Young, D. J., Ching, C. B., & Ng, S. C. (2005b). A reliable synthesis of 2- and 6-amino- β -cyclodextrin and permethylated- β -cyclodextrin. *Tetrahedron Letters*, 46(46), 7905–7907.
<https://doi.org/10.1016/j.tetlet.2005.09.099>
- Muñoz-Botella, S., del Castillo, B., & Martyn MA. (1995). Cyclodextrin properties and applications of inclusion complex formation. *Arsh. Pharm*, 36(2), 187–

198.

- Nandiyanto, A. B. D., Oktiani, R., & Ragadhita, R. (2019). How to Read and Interpret FTIR Spectroscopy of Organic Material. *Indonesian Journal of Science and Technology*, 4(1), 97. <https://doi.org/10.17509/ijost.v4i1.15806>
- Nasikkar, Z., & Khutle, N. (2020). Designing a formulation system to enhance aqueous solubility and dissolution of poorly soluble drug. *Int J Pharm Sci & Res*, 11(8), 3772–3781. [https://doi.org/10.13040/IJPSR.0975-8232.11\(8\).3772-81](https://doi.org/10.13040/IJPSR.0975-8232.11(8).3772-81)
- Nielsen, T. T., Wintgens, V., Amiel, C., Wimmer, R., & Larsen, K. L. (2010). Facile Synthesis of β -Cyclodextrin-Dextran Polymers by “Click” Chemistry. *Biomacromolecules*, 11(7), 1710–1715. <https://doi.org/10.1021/bm9013233>
- Novokshonov, V. V., Xuan, N. T. T., Shaglaeva, N. S., Podgorbunskaya, T. A., & Bayandin, V. V. (2019). Interaction of β -cyclodextrin with tosyl chloride in an aqueous alkaline medium. *Proceedings of Universities Applied Chemistry and Biotechnology*, 3(9), 366–375. <https://doi.org/10.21285/2227-2925-2019-9-3-366-375>
- Nur, H. (2019). A Perspective on Catalysis in the Immiscible Liquid-Liquid System. *Journal of the Indonesian Chemical Society*, 2(2), 66. <https://doi.org/10.34311/jics.2019.02.2.66>
- Onozuka, S., Kojima, M., Hattori, K., & Toda, F. (1980). The Regiospecific Mono Tosylation of Cyclodextrins. *The Chemical Society of Japan*, 53(11), 3221–3224.
- Periasamy, R., Nayaki, S. K., Sivakumar, K., & Ramasamy, G. (2020). Synthesis and characterization of host-guest inclusion complex of β -cyclodextrin with 4,4'-methylenedianiline by diverse methodologies. *Journal of Molecular Liquids*, 316, 113843. <https://doi.org/10.1016/j.molliq.2020.113843>
- Petter, R. C., Salek, J. S., Sikorski, C. T., Kumaravel, G., & Lin, F. T. (1990). Cooperative binding by aggregated mono-6-(alkylamino)- β -cyclodextrins. *Journal of the American Chemical Society*, 112(10), 3860–3868. <https://doi.org/10.1021/ja00166a021>
- Popr, M., Hybelbauerová, S., & Jindřich, J. (2014). A complete series of 6-deoxy-monosubstituted tetraalkylammonium derivatives of α -, β -, and γ -cyclodextrin with 1, 2, and 3 permanent positive charges. *Beilstein Journal of Organic Chemistry*, 10, 1390–1396. <https://doi.org/10.3762/bjoc.10.142>
- Puglisi, A., Spencer, J., Clarke, J., & Milton, J. (2012). Microwave-assisted synthesis of 6-amino- β -cyclodextrins. *Journal of Inclusion Phenomena and Macrocyclic Chemistry*, 73(1–4), 475–478. <https://doi.org/10.1007/s10847-011-0054-z>
- Rachmawati, H., Edityaningrum, C. A., & Mauludin, R. (2013). Molecular

- Inclusion Complex of Curcumin- β -Cyclodextrin Nanoparticle to Enhance Curcumin Skin Permeability from Hydrophilic Matrix Gel. *AAPS PharmSciTech*, 14(4), 1303–1312. <https://doi.org/10.1208/s12249-013-0023-5>
- Raov, M., Mohamad, S., & Abas, M. (2013). Synthesis and Characterization of β -Cyclodextrin Functionalized Ionic Liquid Polymer as a Macroporous Material for the Removal of Phenols and As(V). *International Journal of Molecular Sciences*, 15(1), 100–119. <https://doi.org/10.3390/ijms15010100>
- Řezanka, M. (2018). Synthesis of Cyclodextrin Derivatives. In S. Fourmentin, G. Crini, & E. Lichtfouse (Eds.), *Cyclodextrin Fundamentals, Reactivity and Analysis* (1st ed., pp. 57–103). Springer. https://doi.org/10.1007/978-3-319-76159-6_2
- Sambasevam, K., Mohamad, S., Sarih, N., & Ismail, N. (2013). Synthesis and Characterization of the Inclusion Complex of β -cyclodextrin and Azomethine. *International Journal of Molecular Sciences*, 14(2), 3671–3682. <https://doi.org/10.3390/ijms14023671>
- Sasson, Y., & Neumann, R. (1997). *Handbook of Phase Transfer Catalysis* (Y. Sasson & R. Neumann (eds.); 1st ed.). Springer Netherlands. <https://doi.org/10.1007/978-94-009-0023-3>
- Shipilov, D. A., Kurochkina, G. I., Levina, I. I., Malenkovskaya, M. A., & Grachev, M. K. (2017). Synthesis of monocationic β -cyclodextrin derivatives. *Russian Journal of Organic Chemistry*, 53(2), 290–295. <https://doi.org/10.1134/S1070428017020257>
- Smith, M. B. (2017). Chapter 7 - Functional Group Exchange Reactions: Reductions. In M. B. Smith (Ed.), *Organic Synthesis (Fourth Edition)* (Fourth Edi, pp. 309–418). Academic Press. <https://doi.org/https://doi.org/10.1016/B978-0-12-800720-4.00007-6>
- Starks, C. M. (1971). Phase-transfer catalysis. I. Heterogeneous reactions involving anion transfer by quaternary ammonium and phosphonium salts. *Journal of the American Chemical Society*, 93(1), 195–199. <https://doi.org/10.1021/ja00730a033>
- Strickland, A. D., & Batt, C. A. (2009). Detection of Carbendazim by Surface-Enhanced Raman Scattering Using Cyclodextrin Inclusion Complexes on Gold Nanorods. *Analytical Chemistry*, 81(8), 2895–2903. <https://doi.org/10.1021/ac801626x>
- Tang, W., Muderawan, I. W., Ong, T.-T., & Ng, S.-C. (2005). Enantioseparation of acidic enantiomers in capillary electrophoresis using a novel single-isomer of positively charged β -cyclodextrin: Mono-6A-N-pentylammonium-6A-deoxy- β -cyclodextrin chloride. *Journal of Chromatography A*, 1091(1–2), 152–157. <https://doi.org/10.1016/j.chroma.2005.07.045>

- Tang, W., & Ng, S.-C. (2008a). Facile synthesis of mono-6-amino-6-deoxy- α -, β -, γ -cyclodextrin hydrochlorides for molecular recognition, chiral separation and drug delivery. *Nature Protocols*, 3(4), 691–697. <https://doi.org/10.1038/nprot.2008.37>
- Tang, W., & Ng, S. C. (2008b). Monosubstituted positively charged cyclodextrins: Synthesis and applications in chiral separation. *Journal of Separation Science*, 31(18), 3246–3256. <https://doi.org/10.1002/jssc.200800357>
- Thurein, S. M., Lertsuphotvanit, N., & Phaechamud, T. (2018). Physicochemical properties of β -cyclodextrin solutions and precipitates prepared from injectable vehicles. *Asian Journal of Pharmaceutical Sciences*, 13(5), 438–449. <https://doi.org/10.1016/j.ajps.2018.02.002>
- Trellenkamp, T., & Ritter, H. (2010). Poly(N -vinylpyrrolidone) Bearing Covalently Attached Cyclodextrin via Click-Chemistry: Synthesis, Characterization, and Complexation Behavior with Phenolphthalein. *Macromolecules*, 43(13), 5538–5543. <https://doi.org/10.1021/ma100812q>
- Tripodo, G., Wischke, C., Neffe, A. T., & Lendlein, A. (2013). Efficient synthesis of pure monotosylated beta-cyclodextrin and its dimers. *Carbohydrate Research*, 381, 59–63. <https://doi.org/10.1016/j.carres.2013.08.018>
- Trofymchuk, I. M., Belyakova, L. A., & Grebenyuk, A. G. (2011). Study of complex formation between β -cyclodextrin and benzene. *Journal of Inclusion Phenomena and Macrocyclic Chemistry*, 69(3–4), 371–375. <https://doi.org/10.1007/s10847-010-9757-9>
- Tsioupi, D. A., Stefan-vanStaden, R.-I., & Kapnissi-Christodoulou, C. P. (2013). Chiral selectors in CE: Recent developments and applications. *ELECTROPHORESIS*, 34(1), 178–204. <https://doi.org/10.1002/elps.201200239>
- Vizitiu, D., Walkinshaw, C. S., Gorin, B. I., & Thatcher, G. R. J. (1997). Synthesis of Monofacially Functionalized Cyclodextrins Bearing Amino Pendent Groups. *The Journal of Organic Chemistry*, 62(25), 8760–8766. <https://doi.org/10.1021/jo9711549>
- Wade, L. G. (2013). *Organic Chemistry* (Eight edit). Pearson Education, Inc. <https://www.pearson.com/us/higher-education/product/Wade-Organic-Chemistry-8th-Edition/9780321768414.html>
- Yasir, M., Asif, M., Kumar, A., & Aggarwal, A. (2010). Biopharmaceutical classification system: An account. *International Journal of PharmTech Research*, 2(3), 1681–1690.
- Zhao, X., Xiao, D., Alonso, J. P., & Wang, D.-Y. (2017). Inclusion complex between beta-cyclodextrin and phenylphosphonicdiamide as novel bio-based flame retardant to epoxy: Inclusion behavior, characterization and

flammability. *Materials & Design*, 114, 623–632.
<https://doi.org/10.1016/j.matdes.2016.11.093>

Zhong, N., Byun, H.-S., & Bittman, R. (1998). An improved synthesis of 6-O-monotosyl-6-deoxy- β -cyclodextrin. *Tetrahedron Letters*, 39(19), 2919–2920.
[https://doi.org/10.1016/S0040-4039\(98\)00417-1](https://doi.org/10.1016/S0040-4039(98)00417-1)

