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Enhanced Bioavailability of Curcumins

Curcumionoids (curcumin and related compounds, such as desmethylcurcumin and bis-desmethylcurcumin) are the main components of rhizomes of turmeric (*Curcuma longa*) used as spice and as yellow colorant mainly in South Asia. In addition to the food application, the beneficial effects on health have been traditionally utilized in India. The mechanism of the antioxidant, antibacterial, antifungal, anticancer and antiinflammatory effects of curcumin have been explored and recently also the benefits in cystic fibrosis and Alzheimer disease have been proved in cellular and animal models [1].

Curcumin is an oil-soluble polyphenol pigment, practically insoluble in water at acidic and neutral pH, soluble in alkali. It has low bioavailability owing to the poor aquous solubility. It was obvious to try cyclodextrins (CDs) for enhancing the solubility as the two phenyl moieties might fit well into the CD cavity (Figure 1). For βCD a stoichiometry of 2:1 (host:guest) was established with an association constant of 5.53×10^5 mol^{-2} L^2 [2]. Later studies suggested 1:1 stoichiometry with most of the CDs.

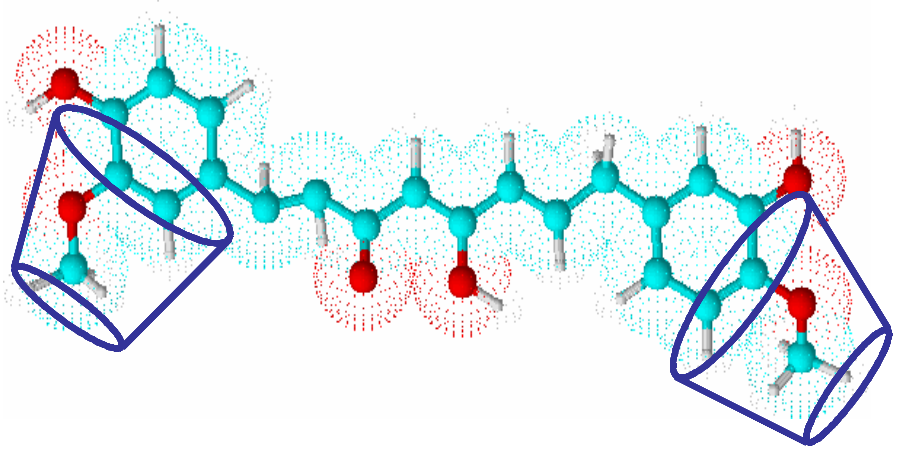

Figure 1. Scheme of curcumin/CD complexes

Aggregation of curcumin/βCD complex resulting in spherical nanoparticles of approx. 500 nm was illustrated by transmission electron microscopic (TEM) images by Yallapu *et al.* [3]. This aggregation helps the cell penetration.

The phase solubility studies showed that all the three natural CDs enhance the solubility of curcumin with αCD giving the highest solubility (Figure 2) [4].

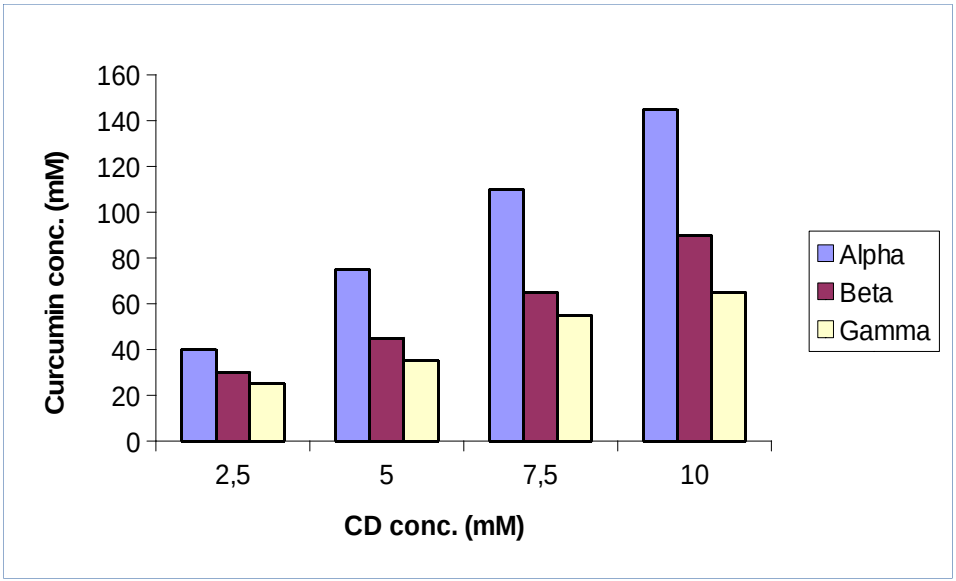

Figure 2. Comparison of the curcumin-solubilizing effect of αCD, βCD and γCD [4]

According to Szente *et al.* RAMEB enhanced the solubility of curcuma oleoresin (curcuminoids obtained by extraction of turmeric with ethanol) by 3 orders of magnitude (Figure 3) [5]. On the other hand, solubility and phase-distribution studies showed that curcuminoids with side groups on the phenyl moiety have higher affinity for the HPGCD than for the βCDs and that the relative affinity of the larger HPGCD cavity increases with the curcuminoid molecular size [6]. Curcumin was found to have a more than 30-fold higher association constant with HPGCD compared to HPBCD in buffer containing 0.5% ethanol [6].

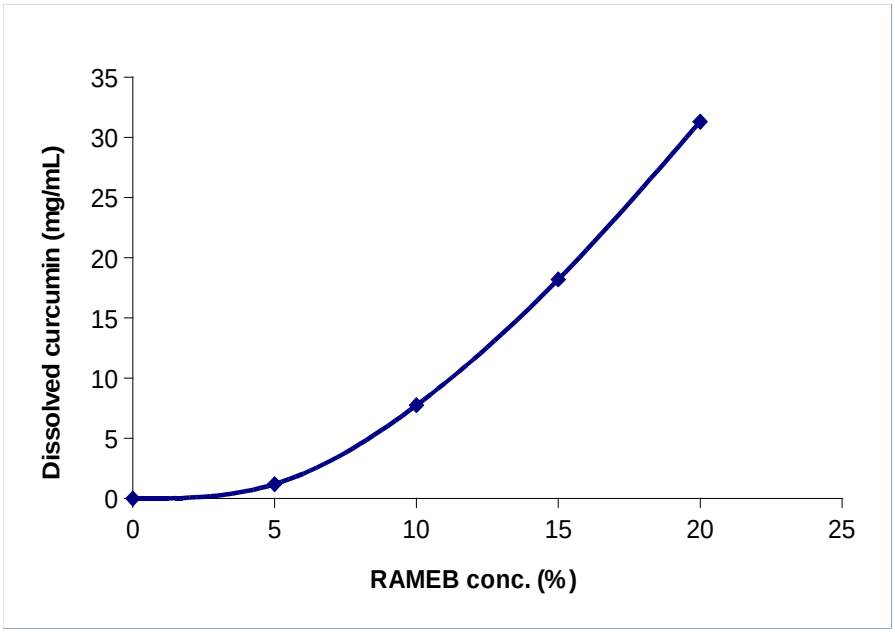

Figure 3. Solubility of curcuma oleoresin in deionised water at 25 °C after 48 h equilibration [5].

Complexation with βCD protects from decomposition upon UV-exposure: curcumin itself is fast decomposed while approx. 80% of residual curcumin content of the βCD complex was measured after 14 years of UV exposure [5]. CDs protect against hydrolytic decomposition in

the order of HPBCD > MeBCD » HPGCD [7].

The enhanced solubility results in enhanced bioavailability and improved clinical effects. Some results are listed in Table 1.

Table 1. Effects of CD-complexation on the biological activity of curcumin

Effect	CD	Ref
Enhanced relative bioavailability (plasma level) after oral administration	α-, β- and γCDs	[4]
Enhanced bioavailability and controlled release against stomach cancer	βCD	[8]
Improved bioavailability in prostate cancer cell line	βCD	[3]
Enhanced oral bioavailability compared to commercial formulations	γCD	[9]
Improved antimicrobial effect in photodynamic therapy of superficial infections	HPBCD, HPGCD	[10, 11]
Higher efficacy against inflammatory bowel disease (IBD) in colitis-induced rat model	HPBCD	[12]
Enhanced cellular uptake and effect against cell proliferation and angiogenesis	HPGCD	[13]
Enhanced apoptopic effect in human lung and ovarian carcinoma cells	CD polymer	[14]

Most recently curcumin/CD complexes formulated in liposomes, magnetic nanoparticles, nanosponges, nanosuspesions, hydrogels etc. have been also studied.

Some of the research results have been translated to the market: the highly bioavailable curcumin/Cawamax W8 (γCD) formulation for application as food supplement is on the product list of Wacker Chemie [9].

References

1. Higdon, J.; Drake, J.V. (2014) Curcumin. [Online] Available from: Linus Pauling Institute, Micronutrient Research for Optimum Health, Oregon State University. http://lpi.oregonstate.edu/infocenter/phytochemicals/curcumin/

2. Tang, B.; Ma, L.; Wang, H.; Zhang, G. (2002) Study on the supramolecular interaction of curcumin and β-cyclodextrin by spectrophotometry and its analytical application. *Journal of Agricultural and Food Chemistry*, 50(6), 1355-1361

3. Yallapu, M. M.; Jaggi, M.; Chauhan, S. C. (2010) β-Cyclodextrin-curcumin self-assembly enhances curcumin delivery in prostate cancer cells. *Colloids and Surfaces, B: Biointerfaces*, 79(1), 113-125

4. Patro, N.M.; Sultana, A.; Terao, K.; et al. (2014) Comparison and correlation of *in vitro, in vivo* and *in silico* evaluations of alpha-, beta- and gamma-cyclodextrin complexes of curcumin. *Journal of Inclusion Phenomena and Macrocyclic Chemistry*, 1-13; DOI:

http://dx.doi.org/10.1007/s10847-013-0322-1

5. Szente, L.; Mikuni, K.; Hashimoto, H.; Szejtli, J. (1998) Stabilization and olubilization of lipophilic natural colorants with cyclodextrins. *Journal of Inclusion Phenomena and Molecular Recognition Chemistry*, 32(1), 81-89

6. Hegge, A. B.; Masson, M.; Kristensen, S.; Toennesen, H. H. (2009) Investigation of curcumin-cyclodextrin inclusion complexation in aqueous solutions containing various alcoholic co-solvents and alginates using an UV-VIS titration method: studies of curcumin and curcuminoides, XXXV. *Pharmazie*, 64(6), 382-389

7. Tomren, M. A.; Masson, M.; Loftsson, T.; Tonnesen, H. Hjorth (2007) Studies on curcumin and curcuminoids. XXXI. Symmetric and asymmetric curcuminoids: stability, activity and complexation with cyclodextrins. *International Journal of Pharmaceutics*, 338(1-2), 27-34

8. Shishu, K. N.; Gupta, N.; Aggarwal, N. (2008) Bioavailability enhancement and targeting of stomach tumors using gastro-retentive floating drug delivery system of curcumin-"a technical note". *AAPS PharmSciTech*, 9(3), 810-813

9. http://www.wacker.com/cms/media/publications/downloads/6816_EN.pdf

10. Haukvik, T.; Bruzell, E.; Kristensen, S.; Tonnesen, H. H. (2009) Photokilling of bacteria by curcumin in different aqueous preparations. Studies on curcumin and curcuminoids XXXVII. *Pharmazie*, 64(10), 666-673

11. Hegge, A.B.; Andersen, T.; Melvik, J. E.; Kristensen, S.; Tonnesen, H. H. (2010) Evaluation of novel alginate foams as drug delivery systems in antimicrobial photodynamic therapy (aPDT) of infected wounds an in vitro study: studies on curcumin and curcuminoides XL. *Journal of Pharmaceutical Science*, 99(8), 3499-3513

12. Yadav, V. R.; Suresh, S.; Devi, K.; Yadav, S. (2009) Effect of cyclodextrin complexation of curcumin on its solubility and antiangiogenic and anti-inflammatory activity in rat colitis model. *AAPS PharmSciTech*, 10(3), 752-762

13. Yadav, V. R.; Prasad, S.; Kannappan, R.; Ravindran, J.; Chaturvedi, M. M.; Vaahtera, L.; Parkkinen, J.; Aggarwal, B. B. (2010) Cyclodextrin-complexed curcumin exhibits anti-inflammatory and antiproliferative activities superior to those of curcumin through higher cellular uptake. *Biochemical Pharmacology*, 80(7), 1021-1032

14. Boztas, A. O.; Karakuzu, O.; Galante, G.; Ugur, Z.; Kocabas, F.; Altuntas, C. Z.; Yazaydin, A. O. (2013) Synergistic interaction of paclitaxel and curcumin with cyclodextrin polymer complexation in human cancer cells. *Molecular Pharmaceutics*, 10(7), 2676-2683

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Budapest, HUNGARY

BIBLIOGRAPHY & KEYWORDS

1. CDs: Derivatives, Production, Enzymes, Toxicity

Coletti, A.; Elli, S.; Macchi, E.; Galzerano, P.; Zamani, L.; Guerrini, M.; Torri, G.; Vismara, E.

Conformational changes of 1-4-glucopyranosyl residues of a sulfated C-C linked hexasaccharide

1C4 Chair Conformation, Maltotriose, Molecular Mechanics, NOESY Spectroscopy, Sulfated C-C Oligosaccharides, Sulfated Oligosaccharide-Based Drugs

Carbohydrate Research, 2014, *In Press*; DOI:10.1016/j.carres.2014.02.009

Deng, X.; Petitjean, M.; Teste, M-A.; Kooli, W.; Tranier, S.; François, J-M.; Parrou, J-L.

Similarities and differences in the biochemical and enzymological properties of the four isomaltases from saccharomyces cerevisiae

Isomaltase, Isomaltose, Maltose, Proline substitution, Substrate ambiguity, Substrate inhibition, Thermostability, Yeast, α-Glucosidase

FEBS Open Bio, 2014, 4, 200–212; DOI:10.1016/j.fob.2014.02.004

Kun, S.; Bokor, É.; Varga, G.; Szőcs, B.; Páhi, A.; Czifrák, K.; Tóth, M.; Juhász, L.; Docsa, T.; Gergely, P.; Somsák, L.

New synthesis of 3-(β-D-glucopyranosyl)-5-substituted-1,2,4-triazoles, nanomolar inhibitors of glycogen phosphorylase

Bioisoster, C-Glucopyranosyl Derivative, Glycogen Phosphorylase, Inhibitor

Eur. J. Med. Chem., 2014, 76, 567–579; DOI:10.1016/j.ejmech.2014.02.041

Li, Z.; Chen, S.; Gu, Z.; Chen, J.; Wu, J.

Alpha-cyclodextrin: enzymatic production and food applications

Soluble Dietary Fiber

Trends in Food Science & Technology, 2014, 35, 151-160; DOI:10.1016/j.tifs.2013.11.005

Morris, M. J.; Striegel, A. M.

Determining the solution conformational entropy of oligosaccharides by SEC with on-line viscometry detection

Oligosaccharides, Size-Exclusion Chromatography, Solution Conformational Entropy

Carbohydrate Polymers, 2014, 106, 230–237; DOI:10.1016/j.carbpol.2014.02.027

Shankar, R.; Madihah, M.S.; Shaza, E.M.; Nur Aswati, K.O.; Suraini, A.A.; Kamarulzaman, K.

Application of different feeding strategies in fed batch culture for pullulanase production using sago starch

Fed Batch, Maltose, Maltotriose, Panose, Pullulanase, Sago

Carbohydrate Polymers, 2014, 102, 962-969; DOI:10.1016/j.carbpol.2013.10.031

Tamamura, N.; Saburi, W.; Mukai, A.; Morimoto, N.; Takehana, T.; Koike, S.; Matsui, H.; Mori, H.

Enhancement of hydrolytic activity of thermophilic alkalophilic α-amylase from bacillus sp. AAH-31 through optimization of amino acid residues surrounding the substrate binding site

Enzyme Activity, Enzyme Production, Glycoside Hydrolase Family 13, Mutagenesis, Starch

Biochemical Engineering Journal, 2014, 86, 8-15; DOI:10.1016/j.bej.2014.02.014

Wu, S-J.; Chen, J.

Preparation of maltotriose from fermentation broth by hydrolysis of pullulan using pullulanase

Maltotriose, Pullulan, Pullulanase

Carbohydrate Polymers, 2014, 107, 94–97; DOI:10.1016/j.carbpol.2014.02.050

2. CD complexes: Preparation, Properties in solution and in solid phase, Specific guest

Djilani, I.; Nouar, L.; Madi, F.; Haiahem, S.; Bouhadiba, A.; Khatmi, D.

Chapter 15 - Molecular modeling study of neutral and cationic species of ortho-anisidine by β-cyclodextrin

Deformation Energy, GIAO, Inclusion Complex, NBO, PM6, Calculated Deformation Energies, Donor And Acceptor Interactions

Advances in Quantum Chemistry, 2014, 68, 279-291 (Proceedings of MEST 2012: Electronic structure methods with applications to experimental chemistry); DOI:10.1016/B978-0-12-800536-1.00015-0

Sarkar, A.; Kedia, N.; Bagchi, S.

A novel water soluble solvatochromic probe as a micropolarity reporter for homogeneous and microheterogeneous media

Homomicelle, Microenvironment, Micropolarity, Preferential Salvation, β-cyclodextrin Nanocavity

Journal of Luminescence, 2014, 151, 111–122; DOI:10.1016/j.jlumin.2014.02.003

Stalin, T.; Srinivasan, K.; Sivakumar, K.; Radhakrishnan, S.

Preparation and characterizations of solid/aqueous phases inclusion complex of 2, 4-dinitroaniline with β-cyclodextrin

2D ROESY NMR, Inclusion Complex, Patch Dock Server, Molecular Docking Studies

Carbohydrate Polymers, 2014, 107, 72–84; DOI:10.1016/j.carbpol.2014.01.091

Stefaniu, C.; Brezesinski, G.; Möhwald, H.

Langmuir monolayers as models to study processes at membrane surfaces

Bilayers, DNA, GIXD, Interfacial Reactions, IRRAS, Lipids, Nanoparticles, Peptides

Advances in Colloid and Interface Science, 2014, *In Press*; DOI:10.1016/j.cis.2014.02.013

Zhang, J.; Higashi, K.; Ueda, K.; Kadota, K.; Tozuka, Y.; Limwikrant, W.; Yamamoto, K.; Moribe, K.

Drug solubilization mechanism of α-glucosyl stevia by NMR spectroscopy

Aggregation Number, Drug Solubility Improvement, Nuclear Overhauser Effect Spectroscopy, α-Glucosyl Stevia, Micellar Drug Inclusion Capacity

International Journal of Pharmaceutics, 2014, *In Press*; DOI:10.1016/j.ijpharm.2014.01.035

3. CDs in Drug Formulation

Chee, P. L.; Prasad, A.; Fang, X.; Owh, C.; Yeo, V. J. J.; Loh, X. J.

Supramolecular cyclodextrin pseudorotaxane hydrogels: a candidate for sustained release?

Biomaterials, Drug Release, Hydrogel, Kinetics, PEO, PEO-α-CD, BSA, Lysozyme, Protein Release

Materials Science and Engineering: C, 2014, 6–12; DOI:10.1016/j.msec.2014.02.026, 39

Colligris, B.; Alkozi, H. A.; Pintor, J.

Recent developments on dry eye disease treatment compounds

Anti-Inflammatory, Dry Eye, Keratitis Sicca, Keratoconjunctivitis Sicca, Mucin Secretion, NSAID, Tear Secretion, Xerophthalmia

Saudi Journal of Ophthalmology, 2014, 28, 19-30; DOI:10.1016/j.sjopt.2013.12.003

Doktorovova, S.; Souto, E. B.; Silva, A. M.

Nanotoxicology applied to solid lipid nanoparticles and nanostructured lipid carriers – A systematic review of *in vitro* data

Cytotoxicity, In vitro Studies, Lipid Nanoparticles, Solid Lipid Nanoparticles

European Journal of Pharmaceutics and Biopharmaceutics, 2014, *In Press*; DOI:10.1016/j.ejpb.2014.02.005

Dragan, E. S.

Design and applications of interpenetrating polymer network hydrogels. a review

Dyes, Heavy Metals, Hydrogels, Interpenetrating Polymer Network, Sorption, Hydrogels Based on Polysaccharides

Chemical Engineering Journal, 2014, 243, 572–590; DOI:10.1016/j.cej.2014.01.065

Enter, D.; Spinhoven, P.; Roelofs, K.

Alleviating social avoidance: effects of single dose testosterone administration on approach-avoidance action

Angry Facial Expressions, Approach-Avoidance Task, Social Action, Social Approach Motivation, Testosterone Administration, Threat Avoidance

Hormones and Behavior, 2014, *In Press*; DOI:10.1016/j.yhbeh.2014.02.001

Etherson, K.; Halbert, G.; Elliott, M.

Determination of excipient based solubility increases using the CheqSol method

CheqSol, (2-Hydroxy)propyl-β-cyclodextrin, Monoprotic Acids and Bases, Poloxamers, Solubility, Ibuprofen, Gliclazide, Atenolol and Propranolol

International Journal of Pharmaceutics, 2014, *In Press*; DOI:10.1016/j.ijpharm.2014.02.007

Fonseca, N. A.; Gregório, A. C.; Valério-Fernandes, Â.; Simões, S.; Moreira, J. N.

Bridging cancer biology and the patient needs with nanotechnology-based approaches

PEGylated Liposomes, Polymeric Nanoparticles, Tumor Microenvironment

Cancer Treatment Reviews, 2014, *In Press*; DOI:10.1016/j.ctrv.2014.02.002

Gu, B.; Burgess, D. J.

Chapter 20 - Polymeric materials in drug delivery

Biocompatibility, Controlled Drug Delivery, In vitro Dissolution, Mechanical Properties, Morphology, Surface Analysis

Natural and Synthetic Biomedical Polymers, 2014, 333-349; DOI:10.1016/B978-0-12-396983-5.00021-1

Han, B.; Yang, B.; Yang, X.; Zhao, Y.; Liao, X.; Gao, C.; Wang, F.; Jiang, R.

Host–guest inclusion system of norathyriol with β-cyclodextrin and its derivatives: preparation, characterization, and anticancer activity

Anticancer Activity, Binding Ability, Characterization, Inclusion Complex, Norathyriol

Journal of Bioscience and Bioengineering, 2014, *In Press*; DOI:10.1016/j.jbiosc.2013.12.001

Hanci, V.; Vural, A.; Hanci, S. Y.; Kiraz, H. A.; Ömür, D.; Ünver, A.

Avaliação in vitro das características antimicrobianas de sugamadex

E. Coli, E. Fecalis, Efeito Antimicrobiano, P. Aeruginosa, S. Aureus, Sugamadex

Brazilian Journal of Anesthesiology, 2014, *In Press*; DOI:10.1016/j.bjan.2013.06.002

Huang, Y.; Dai, W-G.

Fundamental aspects of solid dispersion technology for poorly soluble drugs

Drug–Polymer Interaction, Phase Separation, Poorly Soluble Drug, Solid Dispersion

SI: Drug Delivery System and Pharmaceutical Technology, 2014, 18-25; DOI:10.1016/j.apsb.2013.11.001, 4

Ivanova, E. P.; Bazaka, K.; Crawford, R. J.

Chapter 2 - Natural polymer biomaterials: advanced applications

Biodegradable Materials, Drug delivery, Natural Polymers, Tissue Engineering Matrices

New Functional Biomaterials for Medicine and Healthcare, 2014, 32-70; DOI:10.1533/9781782422662.32, Woodhead Publishing

Kemper, M. F.; Stirone, C.; Krause, D. N.; Duckles, S. P.; Procaccio, V.

Genomic and non-genomic regulation of PGC1 isoforms by estrogen to increase cerebral vascular mitochondrial biogenesis and reactive oxygen species protection

Cerebral Blood Vessels, Estrogen, Glutamate-Cysteine Ligase, Glutathione, Mitochondria, Peroxisome Proliferator-Activated Receptor-Gamma Coactivator-1

Eur. J. Pharmacol., 2014, 723, 322-329; DOI:10.1016/j.ejphar.2013.11.009

Kim, K.; Cho, E.; Choi, J. M.; Kim, H.; Jang, A.; Choi, Y.; Lee, I. S.; Yu, J-H.; Jung, S.

Intermolecular complexation of low-molecular-weight succinoglycans directs solubility enhancement of pindolol

Low-Molecular-Weight Succinoglycans, Pindolol, Sinorhizobium Meliloti, Solubility Enhancement, Beta-Blocker, Methyl-β-cyclodextrin, RAMEB

Carbohydrate Polymers, 2014, 106, 101–108; DOI:10.1016/j.carbpol.2014.02.017

Kleteckova, L.; Tsenov, G.; Kubova, H.; Stuchlik, A.; Vales, K.

Neuroprotective effect of the 3α5β-pregnanolone glutamate treatment in the model of focal cerebral ischemia in immature rats

3α5β-Pregnanolone Glutamate, Endothelin-1, Focal Cerebral Ischemia, Immature Rats, NMDA Receptors

Neuroscience Letters, 2014, 564, 11-15; DOI:10.1016/j.neulet.2014.01.057

Kortejärvi, H.; Malkki, J.; Shawahna, R.; Scherrmann, J.- M.; Urtti, A.; Yliperttula, M.

Pharmacokinetic simulations to explore dissolution criteria of BCS I and III biowaivers with and without MDR-1 efflux transporter

BCS, Bioequivalence, Biowaiver, Compartmental Absorption and Transit Model, Drug Dissolution, Permeability, Pharmacokinetic Simulation, Two-Compartment Model

Eur. J. Pharm. Sci., 2014, *In Press*; DOI:10.1016/j.ejps.2014.02.004

Kumar, N.; Kumar, R.

Chapter 6 - Human immunodeficiency virus (HIV) and acquired immunodeficiency syndrome (AIDS)

Gene Therapy, Immunotherapy, Microbicides, Nanodrug Delivery Carriers, Nanovaccines, Cyclodextrin Polymer-Based Nanoparticles

Nanotechnology and Nanomaterials in the Treatment of Life-Threatening Diseases, 2014, 299-345; DOI:10.1016/B978-0-323-26433-4.00006-3, William Andrew Publishing

Larrañeta, E.; Isasi, J. R.

Non-covalent hydrogels of cyclodextrins and poloxamines for the controlled release of proteins

Host–Guest Interactions, Self-Assembly, Poly(Ethylene Oxide)/Poly(Propylene Oxide) (PEO/PPO) Octablock Star Copolymers, Bovine Serum Albumin

Carbohydrate Polymers, 2014, 102, 674-681; DOI:10.1016/j.carbpol.2013.11.002

Lin, C.; Chen, F.; Ye, T.; Zhang, L.; Zhang, W.; Liu, D.; Xiong, W.; Yang, X.; Pan, W.

A novel oral delivery system consisting in "drug-in cyclodextrin-in nanostructured lipid carriers" for poorly water-soluble drug: vinpocetine

Nanostructured Lipid Carriers (NLC), Oral Bioavailability, Poorly Water-Soluble Drugs, Vinpocetine–Cyclodextrin–Tartaric Acid Complexes

International Journal of Pharmaceutics, 2014, 465, 90–96; DOI:10.1016/j.ijpharm.2014.02.013

Liu, S.; Chen, X.; Zhang, Q.; Wu, W.; Xin, J.; Li, J.

Multifunctional hydrogels based on β-cyclodextrin with both biomineralization and anti-inflammatory properties

Biomineralization, Bone Tissue Engineering, Drug Delivery System, Epichlorohydrin, Succinic Anhydride, Simulated Body Fluid, Apatite, Carboxylated β-Cyclodextrin Hydrogels, Indomethacin

Carbohydrate Polymers, 2014, 102, 869-876; DOI:10.1016/j.carbpol.2013.10.076

Mogoşanu, G. Dan; G., Alexandru M.

Natural and synthetic polymers for wounds and burns dressing

Extracellular Matrix, Polymers, Regenerative Medicine, Wounds

Int. J. Pharm., 2014, 463, 127-136; DOI:10.1016/j.ijpharm.2013.12.015

Parisi, O. I.; Puoci, F.; Restuccia, D.; Farina, G.; Iemma, F.; Picci, N.

Chapter 4 - polyphenols and their formulations: different strategies to overcome the drawbacks associated with their poor stability and bioavailability

Bioavailability, Encapsulation, Polyphenols, Stability, Water Solubility

Polyphenols in Human Health and Disease, 2014, 29-45; DOI:10.1016/B978-0-12-398456-2.00004-9, Academic Press

Pein, M.; Preis, M.; Eckert, C.; Kiene, F. E.

Taste-masking assessment of solid oral dosage forms–a critical review

Electronic Taste Sensing System, Human Taste Panel, Sample Pretreatment, Standardized Protocols, UV Spectroscopy

Int. J. Pharm., 2014, *In Press*; DOI:10.1016/j.ijpharm.2014.01.036

Pensel, P. E.; Castro, S.; Allemandi, D.; Bruni, S. S.; Palma, S. D.; Elissondo, M. C.

Enhanced chemoprophylactic and clinical efficacy of albendazole formulated as solid dispersions in experimental cystic echinococcosis

Albendazole, Cystic Echinococcosis, Echinococcus Granulosus, Solid Dispersions

Veterinary Parasitology, 2014, *In Press*; DOI:10.1016/j.vetpar.2014.01.027

Peponi, L.; Navarro-Baena, I.; Kenny, J.M.

Chapter 7 - Shape memory polymers: properties, synthesis and applications

Biomedical Applications, External Stimuli Activation, Shape Memory Materials

Smart Polymers and their Applications, 2014, 204-236; DOI:10.1533/9780857097026.1.204, Woodhead Publishing

Rajendiran, N.; Sankaranarayanan, R.K.; Saravanan, J.

Nanostructures formed by cyclodextrin covered aminobenzophenones through supramolecular self assembly

Aminobenzophenone, Cyclodextrin, Molecular Modeling, Nanostructures, Self Assembly, Solvent Effects

Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy, 2014, 127, 52–60; DOI:10.1016/j.saa.2014.02.024

Reis, L.; Chiu, L.L.Y.; Feric, N.; Fu, L.; Radisic, M.

Chapter 3 - Injectable biomaterials for cardiac regeneration and repair

Design Criteria, Hydrogel, Myocardial Infarction, Natural and Synthetic Polymers

Cardiac Regeneration and Repair Biomaterials and Tissue Engineering, 2014, 49-81; DOI:10.1533/9780857096715.1.49, Woodhead Publishing

Reyes-Ortega, F.

Chapter 3 - pH-Responsive polymers: properties, synthesis and applications

Control Radical Polymerization, Drug and Gene Delivery, Hydrogels and Nanoparticles Carriers, pH-Responsive Polymer

Smart Polymers and their Applications, 2014, 45-92; DOI:10.1533/9780857097026.1.45, Woodhead Publishing

Samal, S.K.; Dash, M.; Dubruel, P.; Van Vlierberghe, S.

Chapter 8 - Smart polymer hydrogels: properties, synthesis and applications

Drug delivery, Polymers, Smart Hydrogels, Stimuli-Responsive, Tissue Engineering

Smart Polymers and their Applications, 2014, 237-270; DOI:10.1533/9780857097026.1.237, Woodhead Publishing

Sarnes, A.; Kovalainen, M.; Häkkinen, M. R.; Laaksonen, T.; Laru, J.; Kiesvaara, J.; Ilkka, J.; Oksala, O.; Rönkkö, S.; Järvinen, K.; Hirvonen, J.; Peltonen, L.

Nanocrystal-based per-oral itraconazole delivery: superior *in vitro* dissolution enhancement versus Sporanox® is not realized in *in vivo* drug absorption

Bioavailability, Dissolution, In vivo Studies, Nanocrystal Suspension, Poorly Water Soluble Drugs, Solid Oral Nanocrystal Formulation, Wet Milling

Journal of Controlled Release, 2014, 180, 109–116; DOI:10.1016/j.jconrel.2014.02.016

Servant, A.; Bianco, A.; Prato, M.; Kostarelos, K.

Graphene for multi-functional synthetic biology: the last 'zeitgeist' in nanomedicine

Carbon, Drug delivery, Nanomaterials, Nanotechnology

Bioorganic & Medicinal Chemistry Letters, 2014, *In Press*; DOI:10.1016/j.bmcl.2014.01.051

Si, D.; Yang, P.; Jiang, R.; Zhou, H.; Wang, H.; Zhang, Y.

Improved cognitive outcome after progesterone administration is associated with protecting hippocampal neurons from secondary damage studied *in vitro* and *in vivo*

Cognitive Function, Hippocampal Neuron, Progesterone, Traumatic Brain Injury

Behavioural Brain Research, 2014, 264, 135-142; DOI:10.1016/j.bbr.2014.01.049

Skorupska, E.; Jeziorna, A.; Kazmierski, S.; Potrzebowski, M. J.

Recent progress in solid-state NMR studies of drugs confined within drug delivery systems

Antibiotics, Anticancer Drugs, Drug Delivery Systems, Non-Steroidal Anti-Inflammatory Drugs, Solid-State NMR

Solid State Nuclear Magn. Reson., 2014, 2-16; DOI:10.1016/j.ssnmr.2013.12.001, 57–58

Tanaka, Y.; Ishitsuka, Y.; Yamada, Y.; Kondo, Y.; Takeo, T.; Nakagata, N.; Higashi, T.; Motoyama, K.; Arima, H.; Matsuo, M.; Higaki, K.; Ohno, K.; Irie, T.

Influence of NPC1 genotype on the toxicity of hydroxypropyl-β-cyclodextrin, a potentially therapeutic agent, in Niemann–Pick Type C disease models

Autosomal Recessive Disorder, (2-Hydroxy)propyl-β-cyclodextrin, Lysosomal Storage Disease, Niemann–Pick type C, NPC1-Deficient Mice, U18666A, Hepatocellular Necrosis, Renal Tubular Damage, Hemorrhages in Lungs, Resistance to the Lethality

Molecular Genetics and Metabolism Reports, 2014, 1, 19-30; DOI:10.1016/j.ymgmr.2013.12.003

Vu, T.D.; Kofidis, T.

Chapter 6 - Biomaterials and cells for cardiac tissue engineering

Biomaterials, Cardiac Tissue Engineering, Cells, Myocardial Infarction, Scaffolds

Cardiac Regeneration and Repair Biomaterials and Tissue Engineering, 2014, 127-179; DOI:10.1533/9780857096715.2.127, Woodhead Publishing

Wang, J.J.; Christman, K.L.

Chapter 2 - Hydrogels for cardiac repair

Cell Delivery, Injectable Hydrogels, Post-Myocardial Infarction Regeneration

Cardiac Regeneration and Repair Biomaterials and Tissue Engineering, 2014, 17-48; DOI:10.1533/9780857096715.1.17, Woodhead Publishing

Worek, F.; Seeger, T.; Zengerle, M.; Kubik, S.; Thiermann, H.; Wille, T.

Effectiveness of a substituted β-cyclodextrin to prevent cyclosarin toxicity *in vivo*

Detoxification, Nerve Agents, Protection, Small Molecule Scavenger, Pyridinium Oximate

Toxicology Letters, 2014, 226, 222–227; DOI:10.1016/j.toxlet.2014.02.010

Xiong, M-H.; Bao, Y.; Yang, X-Z.; Zhu, Y-H.; Wang, J.

Delivery of antibiotics with polymeric particles

Antibiotic, Bacterial Infection, Drug Resistance, Polymeric Particle

Advanced Drug Delivery Reviews, 2014, *In Press*; DOI:10.1016/j.addr.2014.02.002

Xu, E-Y.; Guo, J.; Xu, Y.; Li, H-Y; Seville, P. C.

Influence of excipients on spray-dried powders for inhalation

Aerosolisation, Pulmonary Delivery, Saccharides, Sustained Release, β-Cyclodextrin-, Starch-, and Sodium Carboxymethylcellulose

Powder Technology, 2014, 256, 217–223; DOI:10.1016/j.powtec.2014.02.033

Yuan, B.; Xu, P-Y.; Zhang, Y-J.; Wang, P-P.; Yu, H.; Jiang, J-H.

Synthesis of biocontrol macromolecules by derivative of chitosan with surfactin and antifungal evaluation

Anti-Sapstain Fungi, Biological Macromolecules, Synthesis, β-Cyclodextrin, Immobilization

International Journal of Biological Macromolecules, 2014, 66, 7–14; DOI:10.1016/j.ijbiomac.2014.02.011

4. CDs in Cell Biology

Castro, B. M.; Prieto, M.; Silva, L. C.

Ceramide: a simple sphingolipid with unique biophysical properties

Ceramide-Gel Domains, Lipid Rafts, Membrane Lipid Domains, Morphological Alterations, N-Acyl Chain Ceramides, Sphingomyelinase

Progress in Lipid Research, 2014, 54, 53-67; DOI:10.1016/j.plipres.2014.01.004

Chen, Y-S.; He, Y.; Chen, C.; Zeng, Y.; Xue, D.; Wen, F-Y.; Wang, L.; Zhang, H.; Du, J-R.

Growth inhibition by pennogenyl saponins from rhizoma paridis on hepatoma xenografts in nude mice

Anticancer Activity, Hepatocellular Carcinoma, Nude Mice, Pennogenyl Saponins, Rhizoma Paridis Axialis

Steroids, 2014, 83, 39-44; DOI:10.1016/j.steroids.2014.01.014

Favretto, M. E.; Wallbrecher, R.; Schmidt, S.; Van de Putte, R.; Brock, Rdolan

Glycosaminoglycans in the cellular uptake of drug delivery vectors — bystanders or active players?

Cell-Penetrating Peptides, Drug Delivery, Endocytosis, Glycocalyx, Syndecan, Virus

Journal of Controlled Release, 2014, 81–90, 180; DOI:10.1016/j.jconrel.2014.02.011

Hoffman, N. J.; Penque, B. A.; Habegger, K. M.; Sealls, W.; Tackett, L.; Elmendorf, J. S.

Chromium enhances insulin responsiveness *via* AMPK

AMP-Activated Protein Kinase, Cholesterol, Chromium, GLUT4, Insulin

The Journal of Nutritional Biochemistry, 2014, *In Press*; DOI:10.1016/j.jnutbio.2014.01.007

Jiang, Z; Redfern, R. E.; Isler, Y.; Ross, A. H.; Gericke, A.

Cholesterol stabilizes fluid phosphoinositide domains

Cholesterol, Domain Formation, Lipid Phase Behavior, Phosphatidylinositol, Phosphatidylinositol-4,5-bisphosphate, Phosphoinositide

Chemistry and Physics of Lipids, 2014, *In Press*; DOI:10.1016/j.chemphyslip.2014.02.003

Klein, A. S.; Tannert, A.; Schaefer, M.

Cholesterol sensitises the transient receptor potential channel TRPV3 to lower temperatures and activator concentrations

Camphor, Carvacrol, Heat-Activated Ionic Currents, Intracellular Calcium Homeostasis, Keratinocyte Differentiation, Non-Selective Cation Channel, Thymol, Vanilloid Receptors, Cholesterol Supplementation

Cell Calcium, 2014, 55, 59-68; DOI:10.1016/j.ceca.2013.12.001

Liu, X.; Wang, G.; You, Z.; Qian, P.; Chen, H.; Dou, Y.; Wei, Z.; Chen, Y.; Mao, C.; Zhang, J.

Inhibition of hypoxia-induced proliferation of pulmonary arterial smooth muscle cells by a MTOR siRNA-loaded cyclodextrin nanovector

Gene Delivery, Nanovector, pH-Sensitive, siRNA Therapy, Smooth Muscle Cell, Polyethylenimine, Ac-αCD, poly(Lactic-co-Glycolic Acid), Apoptosis

Biomaterials, 2014,, 35 4401–4416; DOI:10.1016/j.biomaterials.2014.02.009

Maggo, S.; Ashton, J. C.

Effects of HMG-CoA reductase inhibitors on learning and memory in the guinea pig

Hippocampus, Long-Term Potentiation, Morris Water Maze, Statin, Behavioral Changes

Eur. J. Pharmacol., 2014, 723, 294-304; DOI:10.1016/j.ejphar.2013.11.018

Moullé, V-S.; Picard, A.; Le Foll, C.; Levin, B-E.; Magnan, C.

Lipid sensing in the brain and regulation of energy balance

Energy Balance, FAT/CD36, Hypothalamus, Potassium Channel

Diabetes & Metabolism, 2014, 40, 29-33; DOI:10.1016/j.diabet.2013.10.001

Murphy, C.; English, A.M.; Holden, S.; Fair, S.

Cholesterol-loaded-cyclodextrins improve the post-thaw quality of stallion sperm

Equine, Membrane Fluidity, Reactive Oxygen Species, Sperm, Viability

Animal Reproduction Sci., 2014, 145, 123–129; DOI:10.1016/j.anireprosci.2014.01.013

Okada, Y.; Nishikawa, J-i.; Semma, M.; Ichikawa, A.

Role of lipid raft components and actin cytoskeleton in fibronectin-binding, surface expression, and *de novo* synthesis of integrin subunits in PGE2- or 8-BR-CAMP-stimulated mastocytoma p-815 cells

Cell Adhesion, Fibronectin, Integrin, Lipid Raft Components, Prostaglandin E2, Cholesterol Inhibitor 6-O-α-Maltosyl-β cyclodextrin

Biochemical Pharmacology, 2014, 88, 364–371; DOI:10.1016/j.bcp.2014.01.039

Prendergast, C.; Quayle, J.; Burdyga, T.; Wray, S.

Atherosclerosis affects calcium signalling in endothelial cells from apolipoprotein e knockout mice before plaque formation

Apolipoprotein-E Knockout Mice, Calcium Signalling., Endothelium, Hypercholesterolemia, Methyl-β-cyclodextrin, RAMEB

Cell Calcium, 2014, *In Press*; DOI:10.1016/j.ceca.2014.02.012

Russo, V.; Young, S.; Hamilton, A.; Amsden, B. G.; Flynn, L. E.

Mesenchymal stem cell delivery strategies to promote cardiac regeneration following ischemic injury

Angiogenesis, Cardiac Tissue Engineering, Cell Encapsulation, Injectable Biomaterials, Mesenchymal Stem Cell

Biomaterials, 2014, 35, 3956–3974; DOI:10.1016/j.biomaterials.2014.01.075

Song, X.; Liu, B-C.; Lu, X-Y.; Yang, L-L.; Zhai, Y-J.; Eaton, A. F.; Thai, T. L.; Eaton, D. C.; Ma, H-P.; Shen, B-Z

Lovastatin inhibits human b lymphoma cell proliferation by reducing intracellular ROS and TRPC6 expression

Anti-Cancer Drugs, Cell Cycle, Confocal Microscopy, Intracellular Calcium, Membrane Cholesterol, Oxidative Stress

Biochimica et Biophysica Acta (BBA) - Molecular Cell Research, 2014, 1843, 894-901; DOI:10.1016/j.bbamcr.2014.02.002

Takeo, T.; Fukumoto, K.; Kondo, T.; Haruguchi, Y.; Takeshita, Y.; Nakamuta, Y.; Tsuchiyama, S.; Yoshimoto, H.; Shimizu, N.; Li, M-W.; Kinchen, K.; Vallelunga, J.; Kent Lloyd, K.C.; Nakagata, N.

Investigations of motility and fertilization potential in thawed cryopreserved mouse sperm from cold-stored epididymides

Cold Storage and Transport, Epididymides, In Vitro Fertilization, Motility, Sperm, Sphingosine-1-Phosphate

Cryobiology, 2014, 68, 12-17; DOI:10.1016/j.cryobiol.2013.10.007

Tan, C-C.; Yu, J-T.; Tan, M-S.; Jiang, T.; Zhu, Xi-C.; Tan, L.

Autophagy in aging and neurodegenerative diseases: implications for pathogenesis and therapy

Alzheimer's Disease, Amyotrophic Lateral Sclerosis, Autophagy, Huntington's Disease, Lysosomal Storage Disorders, Parkinson's Disease

Neurobiology of Aging, 2014, 35, 941-957; DOI:10.1016/j.neurobiolaging.2013.11.019

Wang, H.; Perry, J. W.; Lauring, A. S.; Neddermann, P.; De Francesco, R.; Tai, A. W.

Oxysterol-binding protein is a phosphatidylinositol 4-kinase effector required for hcv replication membrane integrity and cholesterol trafficking

Lipid Kinase, Lipid Transfer Proteins, Phosphatidylinositol 4-Phosphate, Viral Replication

Gastroenterology, 2014, *In Press*; DOI:10.1053/j.gastro.2014.02.002

Zhao, S.; Liao, H.; Ao, M.; Wu, L.; Zhang, X.; Chen, Y.

Fixation-induced cell blebbing on spread cells inversely correlates with phosphatidylinositol 4,5-bisphosphate level in the plasma membrane

Cell Blebbing, Cell Fixation, Human Umbilical Vein Endothelial Cells (HUVECs), Lipid Rafts, Phosphatidylinositol 4,5-Bisphosphate (PIP2), THP-1-Derived Macrophages

FEBS Open Bio, 2014, 4, 190–199; DOI:10.1016/j.fob.2014.02.003

5. CDs in Food, Cosmetics and Agrochemicals

Corrales, M.; Fernández, A.; Han, J. H.

Chapter 7 - Antimicrobial packaging systems

Antimicrobials, Commercialization, Legislation, Physico-Chemical Properties

Innovations in Food Packaging (Second Edition), 2014, 133-170; DOI:10.1016/B978-0-12-394601-0.00007-2, Academic Press

Fabra, M. J.; López-Rubio, A.; Lagaron, J. M.

Chapter 15 - Biopolymers for food packaging applications

Biopolymers, Encapsulation, Food Coatings, Food Packaging, Nanotechnology

Smart Polymers and their Applications, 2014, 476-509; DOI:10.1533/9780857097026.2.476, Woodhead Publishing

Hempfling, K.; Engel, K-H.

Chapter 22 - Analysis and sensory evaluation of gooseberry (*ribes uva crispa* l.) volatiles

Aroma, GC-O, Gooseberry, Ribes Uva Crispa L., Volatiles

Flavour Science, 2014, 123-127; DOI:10.1016/B978-0-12-398549-1.00022-2, Academic Press

Kamimura, J. A.; Santos, E. H.; Hill, L. E.; Gomes, C. L.

Antimicrobial and antioxidant activities of carvacrol microencapsulated in hydroxypropyl-beta-cyclodextrin

Antimicrobial Activity, Antioxidant Activity, Carvacrol, (2-Hydroxy)propyl-beta-cyclodextrin Inclusion Complexes, Natural Antimicrobial, Food Industry

LWT - Food Science and Technology, 2014, *In Press*; DOI:10.1016/j.lwt.2014.02.014

Sabater-Jara, A. B.; Almagro, L.; Pedreño, M. A.

Induction of extracellular defense-related proteins in suspension cultured-cells of daucus carota elicited with cyclodextrins and methyl jasmonate

Cyclodextrin, Daucus Carota, Methyl Jasmonate, Pathogenesis-Related Proteins, Cell-Wall-Degrading Enzymes

Plant Physiology and Biochemistry, 2014, 77, 133–139; DOI:10.1016/j.plaphy.2014.02.006

6. CDs for other Industrial Applications

Chen, H-Y.; Zhao, M.; Tan, J-H.; Huang, Z-S.; Liu, G-F.; Ji, L-N.; Mao, Z-W.

β-Biguanidinium-cyclodextrin: a supramolecular mimic of mitochondrial ADP/ATP carrier protein

AMP/ADP/ATP, Mimic, β-Cyclodextrin, Docking Simulation, Arginine Residues

Tetrahedron, 2014, 70(14), 2378–2382; DOI:10.1016/j.tet.2014.02.041

Chiu, C-W.; Huang, T-K; Wang, Y-C; Alamani, B. G.; Lin, J-J

Intercalation strategies in clay/polymer hybrids

Exfoliation, Graphene, Intercalation, Layered Double Hydroxide, Poly(oxypropylene) Amine, Smectite Clay

Progress in Polymer Science, 2014, 39, 443-485; DOI:10.1016/j.progpolymsci.2013.07.002

Dave, B. P.; Ghevariya, C. M.; Bhatt, J. K.; Dudhagara, D. R.; Rajpara, R. K.

Enhanced biodegradation of total polycyclic aromatic hydrocarbons (tPAHS) by marine halotolerant achromobacter xylosoxidans using Triton X-100 and β-cyclodextrin – a microcosm approach

Achromobacter xylosoxidans, Bioremediation, Microcosm, Triton X-100, Chrysene, Glucose as a Co-Substrate

Marine Pollution Bulletin, 2014, 79, 123-129; DOI:10.1016/j.marpolbul.2013.12.027

Fan, B.; Wei, G.; Zhang, Z.; Qiao, N.

Characterization of a supramolecular complex based on octadecylamine and β-cyclodextrin and its corrosion inhibition properties in condensate water

Mild Steel, AES, Acid Corrosion, Anodic Film, 1H NMR, FT-IR, XRD, DSC

Corrosion Science, 2014, *In Press*; DOI:10.1016/j.corsci.2014.01.043

Gaich, T.

Chapter 5.15 The Arene–Alkene Photocycloaddition

Exciplex, Meta Photocycloaddition, Photocycloaddition, Polycyclic Structures

Comprehensive Organic Synthesis II (Second Edition), 2014, 703-731; DOI:10.1016/B978-0-08-097742-3.00516-4, Elsevier

Griesbeck, A.G.; Franke, M.

Chapter 5.04 Photochemical Cycloadditions

Intermolecular and Intramolecular Photochemistry, Selectivity, Sensitization

Comprehensive Organic Synthesis II (Second Edition), 2014, 129-158; DOI:10.1016/B978-0-08-097742-3.00504-8, Elsevier

Han, F.; Liu, Q.; Lai, X.; Li, H.; Zeng, X.

Compatibilizing effect of β-cyclodextrin in RDP/phosphorus-containing polyacrylate composite emulsion and its synergism on the flame retardancy of the latex film

Compatibility, Flame Retardancy, Phosphorus-Containing Polyacrylate, Resorcinol Bis(diphenyl phosphate), β-Cyclodextrin, β-CD was Used as a Compatibilizer, Quality of the Char Formation

Progress in Organic Coatings, 2014, *In Press*; DOI:10.1016/j.porgcoat.2014.02.001

Hu, J.; Lu, J.

Chapter 14 - Smart polymers for textile applications

Moisture-Responsive Polymer, pH-Responsive Hydrogel, Smart Textiles, Thermal-Responsive Hydrogel, Thermal-Responsive Polymer

Smart Polymers and their Applications, 2014, 437-475; DOI:10.1533/9780857097026.2.437, Woodhead Publishing

Iwasawa, N.

Chapter 5.08 Thermal and Metal-Induced [3+2] Cycloadditions

1,3-Dipole, Allylsilane, C–H Activation, Fischer Carbene Complex, Lu Reaction, Meta-Cycloaddition Of Benzene, Methylenecyclopropane, Reductive Coupling, Trimethylenemethane, Vinylcyclopropane

Comprehensive Organic Synthesis II (Second Edition), 2014, 273-350; DOI:10.1016/B978-0-08-097742-3.00508-5, Elsevier

Kato, K.; Ise, T.; Ito, K.

Crystal structure transition of polyrotaxanes attributable to competing rings and backbone induced by in situ modification of the backbone

Cyclodextrin, In-situ Modification, Polyrotaxane, Catalytic Hydrogenation Of Polybutadiene-Based Polyrotaxane, γ-Cyclodextrin

Polymer, 2014, 55 1514–1519; DOI:10.1016/j.polymer.2014.01.044

Rubio-Clemente, A.; Torres-Palma, R. A.; Peñuela, G. A.

Removal of polycyclic aromatic hydrocarbons in aqueous environment by chemical treatments: a review

Advanced Oxidation Process, Ozonation, Photolysis, Polycyclic Aromatic Hydrocarbon, Wastewater Treatment

Science of The Total Environment, 2014, 201-225, 478; DOI:10.1016/j.scitotenv.2013.12.126

7. CDs in Sensing and Analysis

Anubala, S.; Sekar, R.; Nagaiah, K.

Development and validation of an analytical method for the separation and determination of major bioactive curcuminoids in *curcuma longa rhizomes* and herbal products using non-aqueous capillary electrophoresis

Curcuma Longa Rhizomes, Curcuminoids, Herbal Products, Method Development, NACE

Talanta, 2014, 123, 10-17; DOI:10.1016/j.talanta.2014.01.017

Chen, M-L.; Ma, L-Y.; Chen, X-W.

New procedures for arsenic speciation: A review

Arsenic Speciation, Preconcentration/Separation, Review, Sample Pretreatment

Talanta, 2014, *In Press*; DOI:10.1016/j.talanta.2014.02.037

Costas-Mora, I.; Romero, V.; Lavilla, I.; Bendicho, C.

An overview of recent advances in the application of quantum dots as luminescent probes to inorganic-trace analysis

Chemiluminescence, Fluorescence, Liquid-Phase Assay, Luminescent Probe, Multiplexing Analysis, Optical Sensing, Reversible System, Solid-Phase Assay

TrAC Trends in Analytical Chemistry, 2014, 57, 64–72; DOI:10.1016/j.trac.2014.02.004

Evans, S. E.; Kasprzyk-Hordern, B.

Applications of chiral chromatography coupled with mass spectrometry in the analysis of chiral pharmaceuticals in the environment

Chiral Drugs, Environment, Illicit, Mass Spectrometry, Pharmaceuticals, Wastewater

Trends in Environmental Analytical Chemistry, 2014, 1, e34-e51; DOI:10.1016/j.teac.2013.11.005

Ferey, L.; Delaunay, N.; Rutledge, D. N.; Huertas, A.; Raoul, Y.; Gareil, P.; Vial, J.; Rivals, I.

An experimental design based strategy to optimize a capillary electrophoresis method for the separation of 19 polycyclic aromatic hydrocarbons

Capillary Zone Electrophoresis, Cyclodextrins, Design Of Experiments, Edible Oil, Polycyclic Aromatic Hydrocarbons, Sulfobutylether-β-CD, Methyl-β-CD

Analytica Chimica Acta, 2014, *In Press*; DOI:10.1016/j.aca.2014.02.040

Haginaka, J.

Chiral separations: liquid chromatography

Chiral Derivatization, Chiral Ligand Exchange, Chiral Mobile-Phase Additive, Chiral Stationary Phase, Crown Ethers, Donor–Acceptor Phases, Enantioseparation, Liquid Chromatography, Macrocyclic Antibiotics, Polysaccharides, Proteins

Reference Module in Chemistry, Molecular Sciences and Chemical Engineering, 2014; DOI:10.1016/B978-0-12-409547-2.10942-42014, Elsevier

Hamilton, A.; Breslin, C. B.

The development of a highly sensitive urea sensor due to the formation of an inclusion complex between urea and sulfonated-β-cyclodextrin

Cyclodextrin, Inclusion Complexation, Polypyrrole, Urea Sensor, Urease, Electropolymerisation, Cyclic Voltammetry

Electrochimica Acta, 2014, 125, 250-257; DOI:10.1016/j.electacta.2014.01.096

He, B.; Lloyd, D. K.

Chapter 10 - Chiral methods

Analytical Method Development, Chiral Column Screen, Chirality, Chromatography, Circular Dichroism, Electrophoresis, Enantiomer, Polarimetry, Stereoisomer, Validation

Specification of Drug Substances and Products Development and Validation of Analytical Methods, 2014, 193-221; DOI:10.1016/B978-0-08-098350-9.00010-2, Elsevier

Huang, J.; Wang, L.; Shi, C.; Dai, Y.; Gu, C.; Liu, J.

Selective detection of picric acid using functionalized reduced graphene oxide sensor device

Graphene, Picric Acid, Reduced Graphene Oxide, Sensor, β-Cyclodextrin, 1-Pyrenebutyl-amino-β-cyclodextrin

Sensors and Actuators B: Chemical, 2014, 196, 567–573; DOI:10.1016/j.snb.2014.02.050

Jullian, C.; Fernández-Sandoval, S.; Rojas-Aranguiz, M.; Gómez-Machuca, H.; Salgado-Figueroa, P.; Celis-Barros, C.; Zapata-Torres, G.; Adam, R.; Abarca, B.

Detecting Ni(II) in aqueous solution by 3-(2-pyridyl)-[1,2,3]triazolo[1,5-a]pyridine and dimethyl-β-cyclodextrin

Fluorescence, Pyridyltriazolopyridine, Sensor, Supramolecular Sensitizer, DIMEB

Carbohydrate Polymers, 2014, 107, 124–131; DOI:10.1016/j.carbpol.2014.02.043

Li, X.; Zhou, Z.

Enantioseparation performance of novel benzimido-β-cyclodextrins derivatized by ionic liquids as chiral stationary phases

Chiral Stationary Phase, Enantioseparation, HPLC, Ionic Liquid, Mono-6-deoxy-6-(p-N,N,N-trimethylaminobenzimide)-β-CD Nitrate and Tosylate, Mono-6-deoxy-6-(p-N-methylimidazolemethylbenzimide)-β-CD Nitrate and Tosylate

Analytica Chimica Acta, 2014, 819, 122–129; DOI:10.1016/j.aca.2014.02.020

Prakash, S.; Yeom, J.

Chapter 6 - Energy and environmental applications

Energy, Environment, Fuel Cells, Microfluidics, Microsystems, Nanofluidics, Nanosystems, Sensors, Water, Water Contamination Sensors;

Micro and Nano Technologies, 2014, 241-269; DOI:10.1016/B978-1-4377-4469-9.00006-8, William Andrew Publishing

Savina, I.N.; Galaev, I. Yu.; Mikhalovsky, S.V.

Chapter 13 - Smart polymers for bioseparation and other biotechnological applications

Adsorbents, Affinity Precipitation, Bioseparation, Catalysts, Chromatography, Membranes, Smart Polymer, Two-Phase Systems;

Smart Polymers and their Applications, 2014, 408-436; DOI:10.1533/9780857097026.2.408, Woodhead Publishing

Weatherly, C. A.; Na, Y-C.; Nanayakkara, Y. S.; Woods, R. M.; Sharma, A.; Lacour, J.; Armstrong, D. W.

Enantiomeric separation of functionalized ethano-bridged tröger bases using macrocyclic cyclofructan and cyclodextrin chiral selectors in high-performance liquid chromatography and capillary electrophoresis with application of principal component analysis

Cyclodextrin-Based Stationary Phase, Cyclofructan-based Stationary Phase, Enantiomer, Functionalized Ethano-Tröger Base, Principal Component Analysis

J. Chrom. B, 2014, 955–956, 72–80; DOI:10.1016/j.jchromb.2014.01.058

Zhang, Z.; Gu, S.; Ding, Y.; Shen, M.; Jiang, L.

Mild and novel electrochemical preparation of β-cyclodextrin/graphene nanocomposite film for super-sensitive sensing of quercetin

Differential Pulse Voltammetry, Electro-Deposited Grapheme, Nanocomposite Film, Polymerized β-Cyclodextrin, Quercetin

Biosensors and Bioelectronics, 2014, 57, 239–244; DOI:10.1016/j.bios.2014.02.014

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