

DAFTAR PUSTAKA

- Anonim, 2002, Hydroxide Precipitation, Hoffland Environmental Inc., Home >> Turn-Key System >> Hydroxide Precipitation, <http://www.google.com>, Diakses pada 19 Januari 2005.
- Anonim, 2003, Zinc/Hydrazinium Monoformate Reduction of Nitro Compounds to Amines, *SYN COMM*, 33, 2, 281-289.
- Anonim, 2005, Chemical properties - Health and Environmental effects, *Lenntech*, <http://www.lenntech.com/Periodic-chart-elements.htm>, Diakses pada tanggal 18 Januari 2005.
- Arduini, A., Fabbi, M., Mantovani, M., Mirone, L., Pochini, A., Secchi, A., and Ungaro, R., 1995, Calix[4]arenes Blocked in a Rigid Cone Conformation by Selective Functionalization at the Lower Rim, *J. Org. Chem.*, 60, 1454-1457.
- Armenante, P. M., 1999, Precipitation of Heavy Metals from Wastewaters, NJIT, <http://www.yahoo.com>, Diakses pada Juni 2003.
- Arnaud-Neu, F., Collins, E. M., Deasy, M., Ferguson, G., Harris, S. J., Kaitner, B., Lough, A. J., McKervey, M. A., Marques, E., Ruhl, B. L., Schwing-Weill, M., and Seward, E. M., 1989, Synthesis, X-ray Crystal Structures, and Cation-Binding Properties of Alkyl Calixaryl Esters and Ketones, a New Family of Macrocyclic Molecular Receptors, *J. Am. Chem. Soc.*, 111, 8681-8691.
- Arnaud-Neu, F., Barrett, G., Corry, D., Cremin, S., Ferguson, G., Gallagher, J. F., Harris, S. J., McKervey, M. A. and Schwing-Weill, M., 1997, Cation Complexation by Chemically Modified Calixarenes. Part 10. Thioamide Derivatives of *p*-*tert*-butylcalix[4], [5]-, and [6]-arene with Selectivity for Copper, Silver, Cadmium and Lead. X-Ray Molecular Structures of Calix[4]arene Thioamide-Lead(II) and Calix[4]arene Amide-Copper(II) Complexes, *J. Chem. Soc., Perkin Trans. 2*, 575-579.
- Asfari, Z. and Vicens, J., 1988, Preparation of Series of Calix[6]arenes and Calix[8]arenes Derived from *p*-*n*-alkylphenols, *Tetrahedron lett.*, 29, 22, 2659-2660.
- Asfari, Z., Bressot, C., Vicens, J., Hill, C., Dozol, J., Rouquette, H., Eymard, S., Lamare, V., and Tournois, B., 1995, *Anal. Chem.*, 67, 3133-3139.
- Ayres, D. M., Davis, A. P., and Gietka, P. M., 1994, <http://www.mtech.umd.edu/MTES/docs/PMG%20metal%20precip%20man-1.pdf>, Diakses pada tanggal 18 Januari 2005.
- Bassett, J., Denney, R. C., Jeffery, G. H., and Mendham, J., 1986, *Vogel's Textbook of Quantitative Inorganic Analysis Including Elementary Instrumental Analysis*, 834-835, 4th Edition, ELBS, London.



- Baur, L. J. and Gutsche, C. D., 1985, The Formation of Complexes of Calixarenes with Neutral Organic Molecules in Solution, *J. Am. Chem. Soc.*, 107, 6063-6069.
- Beer, P. D. and Shade, M., 1997, Solvent Dependent Anion Selectivity Exhibited by Neutral Ferrocenoyl Receptors, *Chem. Commun.*, 2377-2378.
- Beer, P. D., Hesek, D., Kingston, J. E., Smith, D. K., and Stokes, S. E., 1995, Anion Recognition by Redox-Responsive Ditopic Bis-Cobaltocenium Receptor Molecules Including a Novel Calix[4]arenes Derivative That Binds a Dicarboxylate Dianion, *Organometallic*, 14, 3288-3295.
- Beklemishev, M. K., Elshani, S., and Wai, C. M., 1994, Solvent Extraction of Radium with Crown Ether Carboxylic Acids, *Anal. Chem.*, 66, 20, 3521-3524.
- Benounis, M., Jaffrezic-Renault, N., Halouani, H., Lamartine, R., Dumazet-Bonnamour, I., 2006, Detection of heavy metals by an optical fiber sensor with a sensitive cladding including a new chromogenic calix[4]arene molecule, *Mat. Sci. and Eng., C*, 26, 364-368.
- Biali, S. E., Böhmer, V., Cohen, S., Ferguson, G., Grüttner, C., Grynszpan, F., Paulus, E. F., Thondorf, I., and Vogt, W., 1996, Alkanediyl Bridged Calix[4]arenes: Synthesis, Conformational Analysis, and Rotational Barriers, *J. Am. Chem. Soc.*, 118, 12938-12949.
- Böhmer, V., 1995, Calixarenes, Macrocycles with (Almost) Unlimited Possibilities, *Angew. Chem. Int. Ed. Engl.*, 34, 713-745.
- Bocchi, C., Careri, M., Casnati, A., and Mori, G., 1995, Selectivity of Calix[4]arene-crown-6- for Cesium Ion in ISE: Effect of the Conformation, *Anal. Chem.*, 67, 4234-4238.
- Burgess, J., 1978, *Metal Ions in Solution*, 182-183, Ellis Horwood, Chichester, England.
- Cámara, O. R., 2000, Some Aspect of the Spontaneous Solubility Equilibria of Solid Carbonates, *The Chemical Educator*, Vol. 5, No. 3, <http://chemeducator.org/papers/0005003/530120oc.pdf>, Diakses pada tanggal 18 Januari 2005.
- Careri, M., Casnati, A., Guarinoni, A., Mangia, A., Mori, G., Pochini, A., and Ungaro, R., 1993, Study of the Behavior of Calix[4]arene-Based Sodium-Selective Electrodes by Means of ANOVA, *Anal. Chem.*, 65, 3156-3160.
- Casnati, A., Pochini, A., Ungaro, R., Ugozzoli, F., Arnaud, F., Fanni, S., Schwing, M., Egberink, R. J. M., Jong, F. D., and Reinhoudt, D. N., 1995, Synthesis, Complexations, and Membrane Transport Studies of 1,3-Alternate Calix[4]arene-crown-6 Conformers: A New Class of Cesium Selective Ionophores, *J. Am. Chem. Soc.*, 117, 2767-2777.

- Chang, C. A., 1997, Macrocyclic Lanthanide Coordination Chemistry (Review paper), *Proc. Natl. Sci. Counc. ROC(A)* 21, 1, 1-13.
- Chao, J. C., Hong, A., Okey, R. W., and Peters, R. W., 1998, Proceeding of Conference on Hazardous Waste Research.
- Chen, X., Ji, M., Fisher, D. R., and Wai, C. M., 1998, Carboxylate-derived calixarenes with high selectivity for actinium-225, *Chem. Commun.*, 377-378.
- Choe, J., Chang, S., Satoshi, M., and Nanbu, S., 2003, Ab Initio Study of the Complexation Behavior of Calix[5]arene Derivative toward Alkyl Ammonium Cations, *Bull. Korean Chem. Soc.*, Vol. 24, No. 1, 75-80.
- Choi, J. K., Kim, S. H., Yoon, J., Lee, K., Bartsch, R. A., and Kim, J. S., 2006, A PCT-Based, Pyrene-Armed Calix[4]crown Fluoroionophore, *J. Org. Chem.*, 71, 8011-8015.
- Christian, G. D., 1994, *Analytical Chemistry*, 487-492, John Wiley & Sons, Inc., Singapore.
- Cobben, P. L. H. M., Egberink, R. J. M., Bomer, J. G., Berveld, P., Verboom, W., and Reinhoudt, D. N., 1992, Transduction of Selective Recognition of Heavy Metal Ions by Chemically Modified Field Effect Transistor (CHEMFETs), *J. Am. Chem. Soc.*, 114, 10573-10582.
- Collins, E. M., McKervey, M. A. and Harris, S. J., 1989, Molecular Receptors with the Calix[4]arene Substructure. Synthesis of Derivatives with Mixed Ligating Functional Groups, *J. Chem. Soc. Perkin Trans 1*, 372-374.
- Conner, M., Janout, V., and Regen, S. L., 1992, Synthesis and Alkali Metal Binding Properties of "Upper Rim" Functionalized Calix[4]arenes, *J. Org. Chem.*, 57, 3744-3746.
- Cotton, F. A., Wilkinson, G., and Gaus, P. L., 1987, *Basic Inorganic Chemistry*, 144, John Wiley & Sons, Inc., Singapore.
- Cotton, F. A. and Wilkinson, G., 1988, *Advanced Inorganic Chemistry*, 297-298, 597-622, 682-683, 686-688, 1386-1388, 5th Edition, John Wiley & Sons, Inc., Singapore.
- Dahlan, E. and Biali, S. E., 1989, Octamethylcalix[4]arene, *J. Org. Chem.*, 54, 6003-6004.
- Deligöz, H., Erdem, E., and Kocaokutgen, H., 2000, Solvent Extraction of Fe³⁺ Cation by Diazo-Coupling Calix[4]arenes, *Turk. J. Chem.*, 24, 157-163.

- Duffus, J. H., 2002, Heavy Metals - A Meaningless Tems? (IUPAC Technical Report), *Pure Appl. Chem.*, 74, 5, 793-807.
- Dung, N. T. K. and Ludwig, R., 1999, Solvent extraction of heavy metals with macrocyclic ligands based on calix[4]arenes, *New J. Chem.*, 23, 603-607.
- Fanni, S., Arnaud-Neu, F., McKervey, M. A., Schwing-Weill, M., and Ziat, K., 1996, Dramatic Effects of *p*-Dealkylation on the Binding Abilities of *p*-tert-Butylcalix[6]arenes: New Cs⁺ and Sr²⁺ Selective Receptors, *Tetrahedron Letters*, 37 (44), 7975-7978.
- Furniss, B. S., Rogers, V., Hannaford, A. J., Smith, P. W. G., and Tatchell, A. R., 1986, *Vogel's Textbook of Practical Organic Chemistry – Including Qualitative Organic Analysis*, 387-388, 683-684, 4th Edition, ELBS, London.
- Gebauer, S., Friebe, S., Scherer, G., Gübitz, G., and Krauss, G.J., 1998, High Performance Liquid Chromatography on Calixarene-Bonded Silica Gels. III. Separations of cis/trans Isomers of Proline-Containing Peptides, *Journal of Chromatographic Science*, 36, 388-394.
- Georgiou, G. J., 2005, The Discovery of a Unique Natural Heavy Metal Chelator, *Explore!*, 14, 4, 1-8.
- Gilman, H., Adams, R., Clarke, H. T., Conant, J. B., Marvel, C. S., Noller, C. R., Whitmore, F. C., Allen, C. F. H., 1941, *Organic Syntheses - Collective Volume I*, 445-447, 2nd Edition, John Wiley & Sons, Inc., New York.
- Graham, B.F., Harrowfield, J.M., and Trengove, R.D., 1997, Comparison of Supercritical Fluid Chromatographic and High-Performance Liquid Chromatographic Separations of *p*-tert-Butylcalix[n]arenes, *J. Chr. Sci.*, 35, 232-236.
- Groenen, L. C., Loon, J. V., Verboom, W., Harkema, S., Casnati, A., Ungaro, R., Pochini, A., Ugozzoli, F., and Reinhoudt, D. N., 1991, The 1,2-Alternate Conformation of Calix[4]arenes: A Rare Conformation? Dynamic ¹H NMR Studies of Flexible Tetraalkylated Calix[4]arenes, *J. Am. Chem. Soc.*, 113, 2385-2392.
- Grootenheuis, P. D. J., Kollman, P. A., Groenen, L. C., Reinhoudt, D. N., Hummel, G. J. V., Ugazzoli, F., and Andreetti, G. D., 1990, Computational Study of the Structural, Energetical, and Acid-Base Properties of Calix[4]arenes, *J. Am. Chem. Soc.*, 112, 4165-4176.
- Gutsche, C. D., Dhawan, B., No, K. H., and Muthukrishnan, R., 1981, The Synthesis, Characterization, and Properties of the Calixarenes from *p*-tert-Butylphenol, *J. Am. Chem. Soc.*, 103, 3782-3792.

- Gutsche, C. D. and Levine, J. A., 1982, Synthesis of a Functionalizable Calix[4]arene in a Conformationally Rigid Cone Conformation, *J. Am. Chem. Soc.*, **104**, 2652-2653.
- Gutsche, C. D., Dhawam, B., Levine, J. A., No. K. H., and Bauer, L. J., 1983, Conformational Isomer of the Ethers and Esters of Calix[4]arenes, *Tetrahedron*, **39**, 3, 409-426.
- Gutsche, C. D. and Pagoria, P. F., 1985, Functionalized Calixarene: The Direct Substitution Route, *J. Org. Chem.*, **50**, 5795-5802.
- Gutsche, C. D., Levine, J. A., and Sujeeth, P. K., 1985, Calixarene. 17. Functionalized Calixarene: The Claisen Rearrangement Route, *J. Org. Chem.*, **50**, 5802-5806.
- Gutsche, C. D. and Lin, L. G., 1986, The Synthesis of Functionalized Calixarenes, *Tetrahedron*, **42**, 6, 1633-1640.
- Gutsche, C. D., Iqbal, M., and Alam I., 1987, The Interaction of Calixarenes and Amines, *J. Am. Chem. Soc.*, **109**, 4314-4320.
- Gutsche, C. D. and Nam, K. C., 1988, Calixarene. 22. Synthesis, Properties, and Metal Complexation of Aminocalixarenes, *J. Am. Chem. Soc.*, **110** (18), 6153-6172.
- Gutsche, C. D. and Reddy, P. A., 1991, Conformations and Structures of the Products of Arylmethylation of Calix[4]arenes, *J. Org. Chem.*, **56**, 4783-4791.
- Gutsche, C. D. and Iqbal, M. 1993, *p*-tert-Butylcalix[4]arene, *Organic Syntheses, Coll.*, **8**, 75.
- Gutsche, C. D., 1998^a, *Calixarenes – Monographs in Supramolecular Chemistry*, **20**, 31-32, 36-38, 50-56, The Royal Society of Chemistry, Cambridge.
- Gutsche, C. D., 1998^b, *Calixarenes Revisited – Monographs in Supramolecular Chemistry*, **8**, 42, The Royal Society of Chemistry, Cambridge.
- Hodgson, E. and Levi, P. E., 2000, *A Text of Modern Toxicology*, 261-264, 2nd Edition, McGraw Hill, Singapore.
- Hoekman, T. B., 2005, Heavy Metal Toxicology, <http://www.hbci.com/~wenonah/hydro/heavmet.htm>, Diakses pada tanggal 18 Januari 2005.
- Högberg, A. G. S., 1980, Stereoselective Synthesis and DNMR Study of Two 1,8,15,22-Tetraphenyl[14]metacyclophan-3,5,10,12,17,19,24,26-octol, *J. Am. Chem. Soc.*, **102**, 6046-6050.

- Holm, O., Hansen, E., Lassen, C., Stuer-Lauridsen, F., and Kjølholt, J., 2002, Heavy Metals in Waste, Final Report, European Commission DG ENV. E3 Project ENV.E.3/ETU/2000/0058, COWI A/S, Denmark.
- Hoorn, W. P. V., Briels, W. J., Duynhoven, J. P. M. V., Veggel, F. C. J. M. V., and Reinhoudt, D. N., 1998, Conformational Distribution of Tetramethoxycalix[4]arenes by Molecular Modeling and NMR Spectroscopy: A Study of Apolar Solvation, *J. Org. Chem.*, 63, 1299-1308.
- Hong, W., 1997, The Chemistry of Propargyl Calix[4]resorcinarene, Thesis for the degree of Master of Science, Departement of Chemistry, Faculty of Graduate studies, The University of Western Ontario, Canada.
- Hu, H. and McCally, M., 2002, Human Health and Heavy Metals Exposure, MIT press, <http://www.med.harvard.edu/chge/course/toxic/heavy/mccally.pdf>, diakses pada tanggal 18 Januari 2005.
- Huheey, J. E., 1978, *Inorganic Chemistry – Principles of Structure and Reactivity*, 71-74, 162-163, 276-279, 2nd Edition, Happer International Edition, London.
- Hwang, W. and Shih, J., 2000, Properties and Applications of Cryptand-22 Surfactant for Ion Transport and Ion Extraction, *J. Chin. Chem. Soc.*, 47, 1215-1222.
- Ikeda, A. and Shinkai, S., 1994, On the Origin of High Ionophoricity of 1,3-Alternate Calix[4]arenes: π -Donor Participation in Complexation of Cation and Evidence for Metal-Tunneling through the Calix[4]arene Cavity, *J. Am. Chem. Soc.*, 116, 3102-3110.
- Ikeda, A. and Shinkai, S., 1997, Novel Cavity Design Using Calix[n]arene Skeletons: Toward Molecular Recognition and Metal Binding, *Chem. Rev.*, 97, 1713-1734.
- Israëli, Y and Detelliër, C., 1997, Complexation of the Sodium Cation by a Calix[4]arene Tetraester in Solution. Formation of a 2:1 Calixarene:Sodium Complex, *J. Phys. Chem. B*, 101, 1897-1901.
- Iwamoto, K., Araki, K., and Shinkai, S., 1991, Conformations and Structures of Tetra-*O*-alkyl-*p*-*tert*-butylcalix[4]arenes. How Is the Conformation of Calix[4]arenes Immobilized?, *J. Org. Chem.* 56, 4955-4962.
- Iwamoto, K. and Shinkai, S., 1992, Syntheses and Ion Selectivity of All Conformational Isomers of Tetrakis((ethoxycarbonyl)methoxy)calix[4]-arene, *J. Org. Chem.*, 57, 7066-7073.

- Izatt, R. M., Lamb, J. D., Hawkins, R. T., Brown, P. R., Izatt, S. R., and Christensen, J. J., 1983, Selective M^+-H^+ Coupled Transport of Cations through a Liquid Membrane by Macrocyclic Calixarene Ligands, *J. Am. Chem. Soc.*, **105**, 1782-1785.
- Izatt, S. R., Hawkins, R. T., Christensen, J. J., and Izatt, R. M., 1985, Cation Transport from Multiple Alkali Cation Mixtures Using a Liquid Menbrane System Containing a Series of Calixarene Carries, *J. Am. Chem. Soc.*, **107**, 63-66.
- Jaime, C., Mendoza, J. D., Prados, P., Nieto, P. M., and Sanchez, C., 1991, ^{13}C NMR Chemical Shifts. A Single Rule To Determine the Conformation of Calix[4]arenes, *J. Org. Chem.*, **56**, 3372-3376.
- Jin, T. and Monde K., 1998, Synthesis and Optical Resolution of a Fluorescent Chiral Calix[4]arene with Two Pyrene Moieties Forming an Intramolecular Excimer, *Chem. Commun.*, 1357-1358.
- Jumina, Rastuti, U., Matsjeh, S., 2003, Synthesis of 6-Nitro Veratryl Alcohol and 6-Nitro Veratraldoxim from Vanilin as Intermediates for the Preparation of C-9154 Antibiotic Derivatives, *Indo. J. Chem.*, **3**, *1*, 14-18.
- Jumina, Triwulandari, E., and Anwar, C., 2005, Synthesis of C-Methyl-4,10,16,22-tetramethoxycalix[4]arene from Phenol Using BF_3 -Methanol as the Catalist, *Indo. J. Chem.*, **5**, *1*, 58-65.
- Kakoi, T., Toh, T., Kubota, F., Goto, M., Shinkai, S., and Nakashio, F., 1998, Liquid-Liquid Extraction of Metal Ions with a Cyclic Ligand Calixarene Carboxyl Derivative, *Anal. Sci.*, **14**, 501-506.
- Kang, S. O., Oh, J. M., Yang, Y. S., Chun, J. C., Jeon, S., and Nam, K. C., 2002, HSO_4^- Anion Selective Urea Calix[4]diquinone Receptor, *Bull. Korean Chem. Soc.*, **23**, *1*, 145-148.
- Karger, B. L., Snyder, L. R., and Horvath, C., 1973, *An Introduction to Separation Science*, 247-261, John Wiley & Sons, New York.
- Katz, A., Costa, P. D., Lam, A. C. P., and Notestein, J. M., 2002, The First Single-Step Immobilization of a Calix[4]arene onto the Surface of Silica, *Chem. Mater.*, **14**, 3364-3368.
- Kenis, P. J. A., Noordman, F. J., Hulst, N. F. V., Engbersen, J. F. J., and Reinhoudt, D. N., 1997, Second-Order Nonlinear Optical Active Calix[4]arene Polyamides Suitable for Frequency Doubling in the UV Region, *Chem. Mater.*, **9**, 596-601.

- Khan, I. U., Takemura, H., Suenaga, M., Shinmyozu, T., and Inazu, T., 1993, Azacalixarenes: New Macrocycles with Dimethyleneaza-Bridged Calix[4]arene System, *J. Org. Chem.*, 58, 3158-3161.
- Kim, Y. D., Jeong, H., Kang, S. O., Nam, K. C., and Jeon, S., 2001, Polymeric Membrane Sodium ion-Selective Electrodes Based on Calix[4]arene Triesters, *Bull. Korean Chem. Soc.*, 22 (4), 405-408.
- Kopacz, M. and Kuźniar, A., 2003, Complexes of Cadmium(II), Mercury(II) and Lead(II) with Quercetin-5'-sulfonic Acid (QSA), *Polish J. Chem.*, 77, 1777-1786.
- Leach, A. R., 2001, *Molecular Modelling – Principles and Applications*, 1, 2nd Edition, Pearson Prentice Hall, Harlow.
- Liu, Y., Zhao, B., Zhang, H., Ju, H., Chen, L., and He, X., 2001, Synthesis of Novel Double-Armed *p*-(*tert*-Butyl)calix[4]arene-Derived Amides and Their Lead(II)(Pb²⁺)-Selective-Electrode Properties, *Helv. Chim. Acta*, 84, 1969-1975.
- Lo, T. C., Baird, M. H. I., Hanson, C., 1983, *Handbook of Solvent Extraction*, 53-64, John Wiley & Sons, Singapore.
- Loon, J. V., Arduini, A., Coppi, L., Verboom, W., Pochini A., Ungaro, R., Harkema, S., and, Reinhoudt, D. N., 1990, Selective Functionalization of Calix[4]arenes at the Upper Rim, *J. Org. Chem.*, 55, 5639-5646.
- Magrans, J. O., Mendoza, J. D., Pons, M., and Prados, P., 1997, Are 1,3-Di-O-benzoylcalix[4]arenes an Exception to the ¹³C-NMR Rule for Conformational Determination?, *J. Org. Chem.*, 62, 4518-4520.
- Mahajan, R. K., Kumar, M., Sharma, V., and Kaur, I., 2001, Silver(I) ion-selective membrane based on Schiff base-*p*-*tert*-butylcalix[4]arene, *Analyst*, 126, 505-507.
- Malkhede, D. D., Dhadke, P. M., and Khopkar, S. M., 1999, Solvent-Extraction of Manganenes(II) with Calixarene Substituted with an Acetyl Group at the Lower Rim, *Anal. Sci.*, 15, 781-784.
- March, J., 1985, *Advanced Organic Chemistry - Reactions, Mechanism, and Structure*, 309-310, 315-316, 324, 379, 587, 1103-1105, 3rd Edition, John Wiley & Sons, Singapore.
- Marcos, P. M., Ascenso, J. R., Lamartine, R., and Pereira, J. L. C., 1998, Synthesis and Conformational Characteristic of Inherently Chiral Monoalkyl Ethers of *p*-*tert*-Butyldihimooxacalix[4]arene, *J. Org. Chem.*, 63, 69-74.

- Mazooji, R. and Ebrahimi, S., 2006, Complexation of Di and Tetra-Benzoyloxy Ether Derivatives of Calix[4]arene With Alkali Metal Cations, *Acta Chim. Slov.*, 53, 424-427.
- McMahon, G., O'Malley, S., Nolan, K., and Diamond D., 2003, Important Calixarene Derivatives-their Synthesis and Applications, *ARKIVOC*, (vii) 23-31.
- Morita, Y. and Agawa, T., 1992, Syntheses and NMR Behavior of Calix[4]quinone and Calix[4]hydroquinone, *J. Org. Chem.*, 57, 3658-3662.
- Morohashi, N. and Miyano, S., 2004, Thiocalixarenes: the development of new host molecules utilizing the characteristics of sulfur, TCMAIL, number 122, <http://www.google.com>, Diakses pada bulan Maret 2007.
- Morzherin, Y., Rudkevich, D. M., Verboom, W., Reinhoudt, D. N., 1993, Chlorosulfonylated Calix[4]arenes: Precursors for Neutral Anion Receptors with a Selectivity for Hydrogen Sulfate, *J. Org. Chem.*, 58, 7602-7605.
- Mutihac, L., Buschmann, H. J., and Diacu, E., 2002, Calixarene derivatives as carriers in liquid membrane transport, *Desalination*, 148, 253-256.
- Nabeshima, T., Tsukada, N., Nishijima, K., Ohshiro, H., and Yano, Y., 1996, Remarkably Selective Ag⁺ Extraction and Transport by Thiolariat Ethers, *J. Org. Chem.*, 61, 4342-4350.
- Nam, K. C., Chun, J. C., Kang, S. O., and Ko, S. W., 1999, Upper Rim, Urea Derivative of Calix[4]arene: Anion Selective Neutral Receptor, *Bull. Korean Chem. Soc.*, 20, 9, 1108-1110.
- No, K. H. and Noh, Y. J., 1986, The Synthesis of *p*-Nitrocalix[4]arene, *Bull. Korean Chem. Soc.*, 7, 4, 314-316.
- No, K. H., Kim J. S., Shon, O. J., Yang, S. H., Suh, I. H., Kim, J. G., Bartsch, R. A., and Kim, J. Y., 2001, Synthesis of a Tetrahomodioxacalix[4]arene Tetraamide and the Crystal Structure of Its Lead Ion Complex, *J. Org. Chem.*, 66, 5976-5980.
- Nomura, E., Taniguchi, H., and Tamura, S., 1989, Selective Ion Extraction by a Calix[6]arene Derivative Containing Azo Group, *Chem. Lett.*, 1125-1126.
- Norman, R. O. C., 1978, *Principles of Organic Synthesis*, 134, 325, 647-648, 2nd Edition, Chapman and Hall Ltd., London.
- Notestein, J. M., Andrini, L. R., Kalchenko, V. I., Requejo, F. G., Katz, A., and Iglesia, E., 2007, Structural Assessment and Catalytic Consequences of the Oxygen Coordination Environment in Grafted Ti-Calixarenes, *J. Am. Chem. Soc.*, 129, 1122-1131.

- Ohki, A. and Maeda, S., 1994, Sodium Ion-Selective Electrodes Based on Dibenzo-16-crown-5 Compounds with Pendent Amide Groups, *Anal. Chem.*, **66**, 10, 1743-1746.
- Ohto, K., Yano, M., Inoue, K., Yamamoto, T., Goto, M., Nakashio, F., Shinkai, S., and Nagasaki, T., 1995, Solvent extraction of Trivalent Rare Earth Metal ions with Carboxylate Derivates of Calixarenes, *Anal. Sci.*, **11**, 893-901.
- Ohto, K., Murakami, E., Shinohara, T., Shiratsuchi, K., Inoue, K., Iwasaki, M., 1997^a, Selective extraction of silver(I) over palladium(II) with ketonic devivates of calixarenes from highy concentrated nitric acid, *Anal. Chim. Acta*, **341**, 275-283.
- Ohto, K., Yamaga, H., Murakami, E., Inoue, K., 1997^b, Specific extraction behavior of amide derivative of calix[4]arene for silver(I) and gold(III) ions from highly acidic chloride media, *Talanta*, **44**, 1123-1130.
- Ohto, K., Fujimoto, Y., and Inoue, K., 1999^a, Stepwise extraction of two lead ions with a single molecule of calix[4]arene tetracarboxylic acid, *Anal. Chim. Acta*, **387**, 67-69.
- Ohto, K., Senba, Y., Eguchi, N., Shinohara, T., and Inoue, K., 1999^b, Solid phase extraction of metal ions on resins impregnated with carboxylates of phenolic oligomers, *Solv. Extr. Res. Dev.*, *Jpn*, **6**, 101-112.
- Ohto, K., Inoue, S., Eguchi, N., Shinohara, T., and Inoue, K., 2002, Adsorbtion behavior of lead ion on calix[4]arene tetracarboxylic acid impregnated resin, *Sep. Sci. Technol.*, **37**, 8, 1943-1958.
- Parzuchowski, P., Malinowska, E., Rokicki, G., Brzózka, Z., Böhmer, V., Arnaud-Neu, F., and Souley, B., 1999, Calix[4]arene derived tetraester receptor modified at their wide rim by polymerizable groups, *New J. Chem.*, **23**, 757-763.
- Perrin, C. L. and Skinner, G. A., 1971, Directive Effect in Electrophlic Aromatic Substitution ("Ipso Factors"). Nitrsi of Haloanisoles, *J. Am. Chem. Soc.*, **93**, 14, 3389-3394.
- Perrin, R., Lamartine, R., and Perrin, M., 1993, The potential industrial applications of calixarenes, *Pure & Appl. Chem.*, **65**, 7, 1549-1559.
- Rosenblatt, D. H. and Davis, G. T., 1973, *Laboratory Course in Organic Chemistry*, 325, 2nd Edition, Allyn and Bacon, Inc., Boston.
- Roundhill, D. M., 2004, Novel Strategies for the Removal of Toxic Metals from Soil and Waters, *J. Chem. Educ.*, **81**, 2, 275-283.

- Sastrohamidjojo, H. dan Sardjoko, 1992, *Spektroskopi Inframerah*, 44, Edisi pertama, Liberty, Yogyakarta.
- Scheerder, J., Fochi, M., Engbersen, J. F. J., and Reinhoudt, D. N., 1994, Urea-Derivativezed *p*-*tert*-Butylcalix[4]arenes: Neutral Ligands for Selective Anion Complexation, *J. Org. Chem.*, 59, 7815-7820.
- See, K. A., Fronczek, F. R., Watson, W. H., Kashyap, R. P., and Gutsche, C. D., 1991, Selective Esterification and selective Ester Cleavage of Calix[4]arenes, *J. Org. Chem.*, 56, 26, 7257-7268.
- Shi, Y. and Schneider, H. J., 1999, Interaction between aminocalixarenes and nucleotides or nucleic acids, *J. Chem. Soc., Perkin Trans. 2*, 1797-1803.
- Shu, C., Liu, W., Ku, M., Tang, F., Yeh, M., and Lin, L., 1994, 25,27-Bis(benzoyloxy)calix[4]arenes: Synthesis and Structure Elucidation of *syn* and *anti* Isomers, *J. Org. Chem.*, 59, 3730-3733.
- Silverstein, R. M., Bassler, G. C., and Morrill, T. C., 1991, *Spectrometric Indentification of Organic Compounds*, 117-118, 5th Edition, John Wiley & Sons, Inc., Singapore.
- Śliwa, W., 2002, Calixarene Complexes with Transition Metal, Lanthanide and Actinide Ions, *CCACAA*, 75, 1, 131-153.
- Soedarsono, J., Burgard, M., Asfari, Z., and Vicens, J., 1993, Liquid-liquid Extraction of Sodium and Potassium Using 25,27-Dicarboxy-26,28-Dimethoxy-5,11,17,23-*tetra-tert*-Butylcalix[4]arene, *New J. Chem.*, 17, 601-605.
- Soedarsono, J., Hagege, A., Burgard, M., Asfari, Z., and Vicens, J., 1996, Liquid-liquid Extraction of Rare Earth Metals Using 25,27-Dicarboxy-26,28-Dimethoxy-5,11,17,23-*tetra-tert*-Butylcalix[4]Arene, *Ber. Bunsenges Phys. Chem.* 100, 477-481.
- Soi, A., Bauer, W., Mauser, H., Moll, C., Hampel, F., Hirsch, A., 1998, Investigation on the Dynamic Properties of 25,26,27,28-Tetraalkoxycalix[4]arenes, *J. Chem. Soc., Perkin Trans. II*, 1471.
- Suh, J. K., Kim, I. W., Chang, S. H., Kim, B. E., Ryu, J. W., and Park, J. H., 2001, Separation of Positional Isomers on a Calix[4]arene-methylsiloxane Polymer as Stationary Phase in Capillary GC, *Bull. Korean Chem. Soc.*, 22, 4, 409-412.
- Sun, S., Sepaniak, M. J., Wang, J., and Gutsche, C. D., 1997, Capillary Electrokinetic Chromatography Employing *p*-(Carboxyethyl)calix[n]arenes as Running Buffer Additives, *Anal. Chem.*, 69, 344-348.

- Thondorf, I., 1999, Conformational Interconversions of Partially Dehydroxylated Calix[4]arenes. A Molecular Mechanics Study, *J. Chem. Soc., Perkin Trans. 2*, 1791-1796.
- Trémillon, B., 1993, *Électrochimie Analytique et Réactions en Solution*, 29, Masson, Paris.
- Veravong, S., Ruangpornvisuti, V., Piposanakaton, B., Sukwattanasinitt, M., and Tuntulani, T., 2000, Synthesis of Tetraalkylated Calix[4]arenes and Studies of Their Conformational Behaviors, *ScienceAsia*, 26, 163-170.
- Verboom, W., Durie, A., Egberink, R. J. M., Asfari, Z., and Reinhoudt, D. N., 1992, *Ipso* Nitration of *p*-*tert*-Butylcalix[4]arenes, *J. Org. Chem.*, 57, 1313-1316.
- Vessman, J., Stefan, R. I., Staden, J. F. V., Danzer, K., Lindner, W., Burns, D. T., Fajgelj, A., and Müller, H., 2001, Selectivity in Analytical Chemistry (IUPAC Recommendations 2001), *Pure Appl. Chem.*, 73, 8, 1381-1386.
- Whang, S. S., Ko, S. W., Oh, S. M., Cho, S., and Nam, K. C., 2003, Highly Carboxylate Anion Selective Receptors Containing Trifluoroacetylbenzyl Moieties at the Lower Rim of Calix[4]arene, *Bull. Korean Chem. Soc.*, 24, 2, 165-166.
- Wu, T. T. and Speas, J. R., 1987, Synthesis and Characterization of a Novel Calix[4]arene Tetramethyl Tetraether, *J. Org. Chem.*, 52, 2330-2330.
- Yang, Y. S., Ko, S. W., Song, I. H., Ryu, B. J., and Nam, K. C., 2003, Synthesis and Anion Binding Properties of the Bridged Urea Derivatives of Calix[4]arene, *Bull. Korean Chem. Soc.*, 24, 5, 681-683.
- Yordanova, S., Genova, A., and Miloshev, S., 2006, Modification of *p*-Isopropenylcalix[4]arene with Amino Compounds, *J. Univ. Chem. Tech. Metall.*, 41, 2, 199-204.
- Zeng, X., Weng, L., Chen, L., Leng, X., Ju, H., He, X., and Zhang, Z., 2001, The synthesis of some pyridyl functionalized calix[4]arenes as the sensor molecule for silver ion-selective electrodes, *J. Chem. Soc., Perkin Trans.*, 2, 545-549.
- Zhao, T., Hu, X., Cheng, H., and Lu, X., 1998, Use of calix[4]arene to separate positional isomers in capillary electrophoresis, *Anal. Chem. Acta*, 358, 263-268.