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Nanomaterials based on Molecular Imprinting Technology as selective sorbents for Chiral Molecules

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Abstract

Molecular imprinting is one of the promising techniques for the fabrication of artificial sorbents of the template molecule on a polymer matrix. Molecular imprinted polymers (MIPs) were tailored for the selective and specific recognition of template molecule via a simple polymerization method. In a typical imprinting process, template and functional monomer form a pre-organized complex via covalent or noncovalent interactions followed by co-polymerization in the presence of a cross-linker, initiator and a suitable porogen results the formation of polymer complex. Extraction of the target molecule gives rise to the cavity which is complementary to the template molecule. Chirality is a significant universal phenomenon in nature. Efficient enantio selective tools are necessary for the in-depth study of it in pharmacology and biology and to formulate practical methods for both chiral recognition and separation of enantiomers. The role of MIPs in the specific and selective separation of chiral molecules from enantiomeric mixtures is relevant since the conventional methods are ineffective for resolving the problem of enantiomeric separation. The main objective of the present work is to fabricate an artificial enantio selective sorbent for specific chiral detection of D-Mandelic acid (D-MA), which is an important chiral equivalent of α-hydroxycarboxylic acids in the pharmaceutical synthesis industry. In the present article, we fabricated an artificial sorbent and sensor of D-Mandelic acid (D-MA) on vinyl functionalized multiwalled carbon nanotube (MWCNT) using molecular imprinting technology. For better evaluation, blank polymer (MWCNT-NIP) was prepared by the same procedure, only without using the template molecule in the polymerization process. To get better knowledge of the role of MWCNT on chiral recognition, D-MA imprinted and non-imprinted polymers without MWCNT were also prepared and analyzed. The resulting MWCNT-MIP sensor demonstrated favourable selectivity, good stability and a higher adsorption capacity for the template particle compared to products created by bulk polymerization.

Biography

Gigimol M.G (Sr.Therese Madukakuzhy S.H.) took M.Sc from Kanpur University, PhD from Mahatma Gandhi University under the guidance of Dr.Beena Mathew; Director and Professor, School of Chemical Sciences, M.G University Kottayam Kerala; Recipient of the Young Scientist Award of Govt. of Kerala (Physical Science, 1999) and SRF from CSIR, New Delhi; Member of Indian Science Congress Association; Presented papers in international conferences at Darmstadt (Germany-2010), Riva del Garda (Italy-2015), Paris (France-2017); Author of textbooks 'An Introduction to Quantum Mechanics, Spectroscopy and Photochemistry''Quantum Mechanics and Spectroscopy', 'Physical ChemistryII'and co-author of the text books 'Polymer Chemistry', 'Textbook of Polymer Chemistry' and 'A Textbook of Polymer Chemistry-Theory and Applications'; Approved Research Guide of M.G University, Kottayam; was Principal Investigator of UGC sponsored Major Research Project; was selected as one of the 'Women Achievers in Kerala'(2011) by KSCSTE; Currently working as Principal of Alphonsa College Pala, Kerala; Member of the Sacred Heart Congregation, Pala.

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