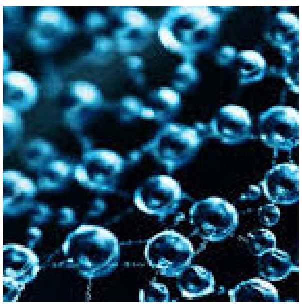
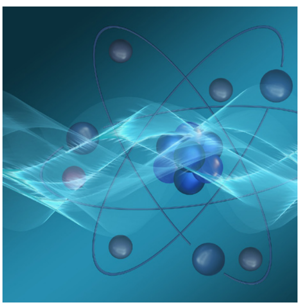
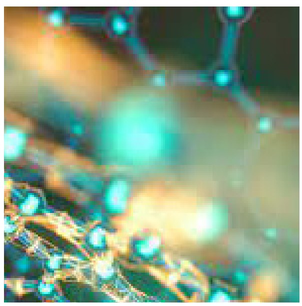
Accepted Abstract

Polymer Science 2021



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Nanomaterial's based on molecular imprinting technology as selective sorbents for chiral molecules

Gigimol M G

Alphonsa College Pala, M.G University, India

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 non-covalent 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.

Fast-acting, broad-spectrum antimicrobial polymers to combat a growing global health concern

Richard J Spontak
North Carolina State University, USA

Adherence of pathogens such as bacteria and viruses on various surfaces routinely leads to subsequent transmission to new hosts, significantly promoting the proliferation of potentially harmful organisms. This sequence is particularly worrisome in the case of antibiotic-resistant pathogens, which are becoming a global threat to human health. According to the U.S. Centers for Disease Control and Prevention, 1 out of every 20 hospital patients is affected by nosocomial infections, subsequently resulting in 100,000 deaths annually in the United States alone. Out of these, about 23,000 deaths are attributed to drug-resistant pathogens such as methicillin-resistant *Staphylococcus aureus* (MRSA). Strains often referred to as "nightmare superbugs" with highly elevated resistance to last-resort antibiotics have been reported all around the world in 2017. While metals (oxides) have been used as surfaces or introduced as nanoparticles into a broad range of substrates to serve as antimicrobial agents and eradicate a wide range of pathogens, they all suffer from eventual reservoir depletion or microbial resistanceand they tend to be pathogen- or condition-specific. Moreover, if not covalently bound or tightly embedded, these nanoparticles can leach into the environment and introduce additional health concerns. In this study, we first discuss a photodynamic polymer composed of an olefinic thermoplastic elastomer modified with zinc tetra(4-N-methylpyridyl)porphine ($ZnTMPyP^{4+}$), a photoactive antimicrobialand show that this combination is effective at inactivating 5 bacterial strains including MRSA, 3 different virusesand a fungus upon exposure to noncoherent light. By achieving antibacterial and antiviral efficacies of at least 99.89%, this methodology, which relies on the formation of singlet oxygen, constitutes a non-specific and highly successful route by which to eliminate harmful pathogens upon simple exposure to visible light and oxygen. Another effective strategy employs only water and a pH jump to kill 99.9999% of antibiotic-susceptible/resistant bacteria and several viruses in just 5 min.

e: spontak@ncsu.edu

Production of Copper and its Industrial Applications

Amit Javier
BOSS International (S.A.R.L.U), Madagascar

About 80 % of primary copper production comes fromlow-grade or poor sulphide ores. After enrichmentsteps, the copper concentrates are usually treated bypyro metallurgical methods. Generally, copper extractionfollows the sequence:1. Beneficiation by froth flotation ofore to give copper concentrate (Optional partial roastingto obtain oxidized material or calcines) 2. Two-stage pyrometallurgical extraction 1. Smelting concentrates to matte2. Converting matte by oxidation to crude (converter orblister) copper 3. Refining the crude copper, usually intwo steps 1. Pyrometallurgically to fire-refined copper 2.Electrolytically to high-purity electrolytic copper. Typicalequipment for crushing to about 20 cm is gyratory andcone crushers. Then wet grinding in semi-autogenous rodor autogenous ball mills takes place. Size classificationtakes is performed in cyclones. In the next step ofbeneficiation, valuable minerals and gangue are separatedby froth flotation of the ore pulp, which exploits thedifferent surface properties of the sulfidic copper ore andthe gangue [46]. The hydrophobic sulfide particles becomeattached to the air bubbles, which are stirred into thepulp, rise with them to the surface of the pulp, and areskimmed off as a froth of fine concentrate. The hydrophilicgangue minerals remain in the pulp. Organic reagentswith sulfurcontaining groups at their polar end, such asxanthates, are used as collectors in the flotation process.Additionally, modifiers like hydroxyl ions (pH adjustment)are used to select different sulfide minerals, for example,chalcopyrite and pyrite. Alcohols are used to stabilize thefroth.

e: spontak@ncsu.edu