MAGNETICALLY RESPONSIVE BIOCOMPOSITES FOR BIOTECHNOLOGY AND ENVIRONMENTAL TECHNOLOGY

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Abstract

Magnetic composite materials have already found many important applications in various areas of biosciences, medicine, biotechnology, environmental technology etc. In most cases they are composed from a diamagnetic component exhibiting appropriate function while the magnetic properties are caused by the presence of iron oxides nano- or microparticles. Such materials can be efficiently separated from difficult-to-handle samples (also those containing particulate impurities), targeted to the desired place, applied as contrast agents for magnetic resonance imaging or used to generate heat during exposure to alternating magnetic field. A large amount of magnetic biocomposites has been developed recently. In many cases magnetic fluids or magnetic nanoparticles can be used to convert biological materials (e.g., microbial and algae cells and cell walls, plant-derived materials, cellulose, chitosan, plant gums, microbiological iron oxides etc.) into their magnetic derivatives. Magnetic biocomposites have been successfully used for immobilization of biologically active compounds (e.g., enzymes) and affinity ligands, and as adsorbents for the isolation of important biomolecules (e.g., lectins) and removal of both organic and inorganic xenobiotics, such as dyes, pesticides, heavy metal ions and radionuclides. Magnetically modified living microbial cells can serve as whole cell biocatalysts. Magnetic modification of biological materials enables to prepare stimuli responsive materials with a great potential for future applications.

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