University of Kent

Materials

Novel biotin-specific Molecularly Imprinted Polymers (MIPs) with a range of chemical, biological and engineering applications

Dr Andrew Hall is the inventor of this technology.
Reference: 034-AH
Protected Intellectual Property: follow link here.

Summary: Molecularly Imprinted Polymers (MPIs) are synthetic compounds able to select, recognise and capture biological substances. MIPs are generated via the polymerisation of monomers in the presence of a template. The present technology concerns the development and polymerisation of new classes of monomers for the generation of specific MIPs against biotin and its derivatives.

Background: Current methods for selection, recognition and capture of substances include the use of enzymes, antibodies, DNA and other biologically active compounds. The use of synthetic compounds has also been investigated, an example of which is Molecularly Imprinted Polymers (MPIs). An MIP is a polymer that has been prepared using molecular imprinting which leaves cavities in a polymer matrix with affinity to a chosen "template" molecule. The process usually involves initiating the polymerisation of monomers in the presence of a template molecule that is extracted afterwards, thus leaving complementary cavities behind. MIPs usually exhibit a high selectivity towards their substrate, analogous to antibody-antigen recognition and sufficient affinity for the original, template molecule and offer a number of advantages compared to natural receptors and antibodies such as high mechanical, thermal and chemical stability, excellent operational and storage stability, simplicity of manufacturing and comparatively low price for material preparation. MIPs have already been used in many fields of chemistry, biology and engineering. Biotin (known as vitamin H/B_7) is necessary for cell growth, the production of fatty acids and the metabolism of fats and amino acids and is well-known to bind to the proteins streptavidin and avidin with one of the highest affinities known (*Kd ca.* 10^{-14} to 10^{-15} M). The strength of this interaction is used extensively in biochemical assays, in which biotin is conjugated to proteins, or other biomacromolecules. Although the avidin-biotin system is recognised as a useful tool for highly sensitive detection, it works only in aqueous solution. Therefore, the development of stable avidin-like materials with binding properties for biotin derivatives in organic solvents may enable the development of new avidin-biotin applications.

Technology: The present technology concerns the generation of new classes of polymerisable monomers targeting biotin and related structures and to MIPs obtainable by polymerisation of at least one of these monomers and at least one cross linking monomer in the presence of a suitable template molecule. The obtained polymers can be used for separation of biotin and related small molecules, together with larger biotinylated molecules of biological origin (e.g. proteins), from complex mixtures. Of note is the fact that these functional monomers are prepared from two different building blocks, contrary to other monomers. That renders the resulting MIP to possess increased stability and binding capacity for biotin. Furthermore, the new monomers are used stoichiometrically (e.g. 1:1) with respect to the template (biotin) species and so, when polymerized, the resulting polymer has a large proportion of uniform binding sites, with high affinity for biotin and its derivatives.

Photovoltaically Active Perovskite Materials

Principal Inventor: Professor Mark Green
Reference: 060
Summary: Perovskite-type materials that can be used in photovoltaic devices such as solar cells. The invention also relates to devices comprising the perovskite-type materials.