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Stimuli-responsive biomaterials for drug delivery and tissue engineering

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Stimuli-responsive instructive biomaterials are particularly attractive for the treatment of a variety of conditions either via the controlled delivery of precise quantities of drugs at specific locations and times, or indeed delivery of a cue (e.g. chemical, electrical, light, mechanical, topographical) to the cells interacting with the material (e.g. in the form of a medical device or tissue scaffold).

Materials responding to stimuli such as enzymes, light, pH, temperature, ultrasound and electric/magnetic fields have been developed for use as drug delivery devices, medical devices and tissue scaffolds. An interesting research area is the development of materials capable of controlling either cell behavior or the delivery of drugs in response to electricity, light and magnetism.

Here we report the development of polymer-based materials that enable the delivery of drugs in response to electrical fields, light and magnetism; the tuneable properties of the materials make them attractive components of electroactive/photoresponsive biomaterials that when non-degradable have potential application for long term medical devices (e.g. bioactive coatings, electrodes, tools), and when degradable have potential application for short term applications (e.g. drug delivery or tissue engineering). An overview of these developments will be presented.

Biography

John Hardy undertook his undergraduate and doctoral studies chemistry in Bristol and York in the UK. Thereafter he undertook 10 years of interdisciplinary postdoctoral research (in Biomedical/Chemical Engineering, Materials Science and Pharmacy) in France, Germany, Northern Ireland and the USA before returning to the UK for a 50th Anniversary lectureship in materials chemistry at Lancaster University. He has received a variety of awards from charities, governmental bodies and industry, and serves on the editorial board of a number of journals including Future Science OA and the International Journal of Molecular Sciences.

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