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State-of-the-art of stimuli-responsive materials

Dear Readers,

Stimuli-responsive materials are widespread demand among researchers, customize them via chemistry which trigger to induce conformational changes in structures or to take advantage in the form of structural/molecular pedals. The size and dimension oriented materials are being formulated to sense precise environmental changes and can adjust in a predictable manner to make them effective tool for cutting-edge technology. A significant change in the size, structure and properties can be induced by a slight induction of stimulus due to changes in pH, ionic strength, temperature, light or other triggers. The responsive materials can be categorised on the basis of their responsive behaviours during the stimuli for example piezoelectric materials- a swift, linear shape change of materials in response to an electric field and find potential applications in the actuators; electrostrictive and magnetostrictive materials- change in materials size with response to either an electric or magnetic field, and conversely, producing a voltage during stretch and show promising applications for manufacturing of pumps and valves, aerospace wind tunnel, shock tube instrumentation, landing gear hydraulics, and further biomechanics force measurement of ortho-pedic gait and posturography, sports, ergonomics, neurology, cardiology and rehabilitation; rheological materials- electrorheological and magnetorheological fluids that can change state instantly using an electric or magnetic field and uses in vehicle seats, shock absorbers, exercise equipment, and optical finishing; thermo-responsive materials- the materials leading the change in shape with response to heat and/or cold and applicable in couplers, thermostats, automobile, plane and helicopter parts; pH-sensitive materials- materials change colours as a function of pH and promise in paints; electrochromic materials- material to change optical properties by applied voltage and can be used as antistatic layers, electrochrome layers in liquid crystal displays, and cathodes in lithium batteries; responsive gels- reply in term of shrinking or swelling of materials and can be programmed to absorb or release fluids with response to chemical or physical stimulus and applications in agriculture, food, drug delivery, prostheses, cosmetics, and chemical processing.

The combination of functional properties with elementary materials has led to the development of a wide range of advanced materials which could produce an overabundance of compatible strategy for the development of ‘smart’ technology. Engineering of stimuli-responsive materials at various levels has establish outstanding multi-mode functions. In the area of biomedical technology, this could visually explore trigger mechanisms of diseases, such as the contribution of stromal cells to tumour progression or tumour eradication, and the role of tumour microenvironment hallmark functions including inflammation, pH and ionic strength. It can be delivered a single platform for target, diagnose and deliver therapeutic agents to treat cancers.

With kindest regards

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