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Fibrin functionalized Graphene oxide as an osteoinductive material

T. P Sastry and R. Deepachitra
Central Leather Research Institute, India

Surface functionalized graphene oxide (SFGO) nanoparticles find its wide biomedical applications such as biosensors, biomedicine, bio-imaging, drug delivery and biodetection. This versatile biomedical application of GO is due to its biochemical nature, which enables greater interactions with biomolecules such as proteins through covalent and non-covalent interactions. Apart from this, the honeycomb crystal structure of GO acts as a platform for the addition of various biomolecules, which form incredible GO biomaterials. The biological compatibility of SFGO is evaluated using *in vitro* studies and this is supported by conducting experiments such as biocompatibility and haemocompatibilty. Fibrin (F) is an insoluble protein, serves as an ideal substrate for cell attachment, proliferation, extracellular matrix formation in wound healing and as a biological scaffold in tissue engineering. The drugs/hydroxy apatite can also be coupled to the fibrin based nanomaterials through the ligands. The fibrin isolated from biological waste material is used to functionalize the GO to make it as a multifunctional therapeutic nanocarrier for its biomedical applications. Thus prepared SFGO nanoparticles is characterized using UV-visible spectroscopy, fourier transform infra-red spectroscopy, scanning electron microscopy, transmission electron microscopy and X-ray diffraction technique. The biological evaluation such as biocompatibility and osteoconductivity was carried out using 3-(4, 5-dimethylthiazol-2-Y)-2, 5-diphenyltetrazolium bromide and alkaline phosphatase assays using both normal (NIH 3T3) and cancer (MG 63) cell lines. The results reveal biocompatibility and osteoinductive of the SGFO. Based on this finding, SGFO might be tried as an osteoinductive material in small animals.

Biography

T. P Sastry is presently working as Senior Principal Scientist and Head in Bio-products Lab, Central Leather Research Institute, Chennai, India. He has completed his Ph.D. in Chemistry and has thirty years of research experience in the processing of animal bio-products into biomaterials and reducing the environmental pollution due to tannery and slaughter house wastes. He has published more than 70 papers in national and international journals and filed 17 patents. He has commercialized 6 technologies to the relevant industries and 2 technologies were commercialized to an international company. He is expert in preparation, characterization and evaluation of Nano Biomaterials used in wound dressing, ophthalmic, oral and orthopedic surgery.

tpsastry@hotmail.com

Supramolecular coordination nanochannels for creating functional polymer materials

Takashi Uemura
Kyoto University, Japan

Recently, Metal-Organic Frameworks (MOFs) composed of metal ions and organic ligands have been extensively studied. The characteristic features of MOFs are high regularity, controllable pore sizes approximating molecular dimensions, and designable pore surface functionality. Use of their regulated and tunable nanochannels for a field of polymerization can allow multi-level controls of the resulting polymer structures. In addition, construction of nanocomposites between MOFs and polymers will provide unprecedented material platforms to accomplish many nanoscale functions.

Controlled radical polymerization of vinyl monomers can be attained in MOF nanochannels. For example, isotacticity of vinyl polymers drastically increased in comparison with the conventional bulk and solution systems. Controlled uniaxial alignment of vinyl polymer chains could be attained in 1D channels of MOFs with cross-linkable ligands. A variety of polymerization reactions can be also catalyzed in functionalized MOFs. For example, MOFs with specific basic sites accelerated stereo- and monomer-selective polymerization of substituted acetylenes. Oxidative polymerizations of pyrrole within 2D and 3D MOFs containing redox-active sites gave polypyrroles whose orientations are directly related to the original host templates. We also studied the properties of polymer chains confined in the nanochannels of MOFs. For example, incorporation of polyethylene glycol (PEG) into the MOF nanochannels enabled observation of thermal transitions of only a few chain assemblies. Fluorescent oligomers accommodated in a flexible MOF showed conformational variations concurrently with the host structural change during gas adsorption, which is a key for fluorescent detection of gases.

Biography

Takashi Uemura has completed his Ph.D. at the age of 27 years from Kyoto University. Then he became an Assistant Professor in the same institute, and was promoted associate professor in 2010. During 2006-2010, he has also worked as a researcher in PRESTO program of Japan Science and Technology Agency (JST). In 2010, he was awarded the Chemical Society of Japan Award for Young Chemists. His current research interests include preparation and property of synergistic nanohybrids between coordination compounds and polymer materials, in particular, polymer chemistry in confined coordination framework.

uemura@sbchem.kyoto-u.ac.jp