第54回 新大先端化学セミナー

主催：理学部化学プログラム
共催：医療・化学コアステーション準備委員会
UGCE連携教育研究センター

日時：**2024年10月18日16:00～17:00**
場所：理学部大会議室
演題：**Surface Engineered Nanosystems for Bio-medical and Space Applications**

演者：**Prof. Kuruvilla Joseph (**kjoseph.iist@gmail.com**)**
Department of Chemistry, Indian Institute of Space Science and Technology

概要：

In the field of medicine, its applications are not less than a magic. The availability of more durable and better prosthetics and new drug-delivery systems are of great scientific interest and give hope for cancer treatment and minimum invasive treatments for heart disease, diabetes and other diseases. One of the most promising societal impacts of nanotechnology is in the area of nanomedicine. Personalized health care, rational drug design, and targeted drug delivery are some of the benefits of a nanomedicine based approach to therapy. The most promising areas of nanomedicine are diagnostics by in vitro imaging and cancer therapies in ovarian cancer by the use of nanoparticles. New approach is its use as therapeutics modalities for infertility. Nanotechnology will serve as multifunctional tools that will not only be used with any number of diagnostic and therapeutic agents, but will change the very foundations of cancer diagnosis, treatment, and prevention. Nanotechnology is applied to the field of cancer in the development of nanovectors, which can be loaded with drugs or imaging agents and then targeted to tumours. Combined technologies can be used for both earlier diagnosis and better treatment for patients with cancer. Nanotechnology is poised to have an increasing impact on cardiovascular health in coming years. Drug delivery will be impacted by targeting of nanoparticles encapsulated drugs to the site of action, increasing the effective concentration and decreasing systemic dosage and side effects. Nanotechnologies and micro technologies can be merged with biomaterials to generate scaffolds for tissue engineering that can maintain and regulate cell behavior. Also, such technologies can be used to regulate in vitro cellular microenvironment to direct stem cell differentiation. Recent developments in the use of nanotechnologies with stem cells have been motivated by the continuous introduction of novel nanotechnology multidisclipency platforms during the last few years.

The mechanical and thermal properties of polymers and composite structures can be altered through the use of various kinds of fillers. The dimensions of these fillers typically fall on a macroscopic (1 m m–1 mm) length scale. However, macroscopic fillers usually cause decreases in strength, impact resistance, and processability. A new area of composites research has emerged in the last two decades that utilizes nanoparticle fillers to alter the properties of polymers. Nano particle fillers can increase the modulus, strength, toughness, resistance to chemical attack, gas impermeability, resistance to thermal degradation, and dimensional stability of polymeric materials. Carbon nanotubes, nano silica, nano clay, POSS etc., are extensively used as reinforcing agents in nanocomposites. The major difficulty in optimizing composite properties with nano reinforcing agent is achieving sufficient dispersion in the epoxy matrix. The difficulty in achieving good dispersion of CNT is resolved by proper functionalization of the nano tubes. By judiciously selecting the modifier and grafting with nano reinforcing agent, we can improve the compatibility with matrix and thereby tailor the material for specific applications.

問い合わせ先：梅林 泰宏（**yumescc@chem.sc.niigata-u.ac.jp**）