# Smart Nano-biomaterials for Drug, Gene, Cell Delivery

Professor Tae Gwan Park
Korea Advanced Institute of Science and Technology
Department of Biological Sciences
Daejeon 305-701, Korea
e-mail: tgpark@kaist.ac.kr

A variety of novel nano-biomaterials, such as stimuli-sensitive hydrogels, polymeric micelles, nanoparticles, and microparticles, have been studied for drug delivery, tissue engineering, and gene therapy. A number of biodegradable polymers and smart hydrogels containing bioactive molecules including therapeutic protein drugs have been utilized for achieving sustained release and target-specific delivery. Macroporous biodegradable scaffolds with a controlled degradation rate were also fabricated to regenerate cartilage and bone tissues. Self-assembled nano-scale particulates and micelles tagged with a cancer-targeting moiety on the surface were produced for actively targeting tumor cells. Recently, various novel inorganic/organic hybrid materials were synthesized for efficient intracellular delivery of antisense ODN, siRNA, magnetic nanoparticles, and optical imaging agents into cells. We are particularly interested in self-assembled bio-mimetic nano-biomaterials useful for therapeutic and diagnostic applications. Synthetic polymers and biomolecules (peptides, proteins, and nucleic acids) have been physically and chemically hybridized to create novel functional biomaterials.

In this presentation, my research activities during the past 20 years will be briefly reviewed and future perspectives will be discussed. They are:

1) Immobilized enzymes and cells within poly(N-isopropyl acrylamide) hydrogels: thermally cycling effect on the modulation of activity
2) Controlled protein delivery systems using biodegradable polymeric microspheres and in-situ forming phase transition hydrogels
3) Macroporous and surface engineered PLGA scaffolds and microcarriers for tissue engineering
4) PEGylated siRNA: local and systemic delivery systems
5) Bio-inspired surface modification of inorganic nanoparticles for molecular imaging and biosensing