세미나 초록

성명	박종남
소속	울산과학기술원 바이오메디컬 공학과/ 에너지화학공학과
발표 주제	Synthesis of Surface Engineered Quantum Dots for Optoelectronic and Biological Applications
발표 내용	Colloidal semiconductor quantum dots (QDs) have attracted considerable attention in various disciplines due to their unique size- and shape-dependent optical and electronic properties. As of today, various semiconductors have been suggested, and InP QDs can be recognized as important candidates for Cd-free environmentally benign emitters, operating across the entire visible range. However, despite the recent efforts to synthesize high-quality InP QDs, reliable protocols are still required for realizing their reproducible size control, narrow size distribution, and large-scale production. In this work, we report the large-scale synthesis of highly luminescent InP@ZnS QDs from an elemental P precursor (P4),which was simply synthesized via the sublimation of red P powder. The size of the InP QDs was controlled by vary ing the reaction parameters such as the reaction time and temperature,and the type of In precursors. We have also developed QDs with small hydrodynamic radius, containing various functional groups readily compatible for conjugation to bio-molecules. The main advantage of making the smallest QDs as possible is that we expect to see the enhancement in many properties, including the increase of diffusion rate and decrease of a steric hindrance to bio-molecule conjugation when compared to the larger QDs. To achieve this goal, we would like to design new biocompatible ligands, modify the surface of nanomaterials using newly designed molecules by ligand exchange method, and finally test the cell viability of those new materials by incubating in the cell. For the stable dispersion of QDs, we synthesized a new type of zwitterionic polymer ligand to render QDs surface adsorptive, thus developing a diagnostic agent which can retain their dimension stability from protein coagulation. The zwitterionic polymer is a random copolymer synthesized by living radical polymerization with narrow molecular weight distribution. When we characterized the surface-engineered colloidal nanocrystals using DLS and TEM, the resulting nanocrystals showed good chemical stability and magnetic property. We also applied our nanomaterials for lateral flow analysis to detect the malaria antigen, demonstrating the performance successfully.