Synthesis and Characterization of Germanium Nanocrystals

Research topics in this area include solution synthesis and characterization of germanium nanocrystals (GeNCs), self-assembly of GeNCs and plasma etching. Application of GeNCs covers optoelectronics, non-linear optics and sensors. However, germanium nanocrystals have not been widely used as other compound semiconductor due to the difficulty of synthesis. The covalent bond nature of group IV semiconductor requires high pressure and temperature to synthesize nanocrystals, which hinders further application of these materials.

We have developed a novel method to synthesize GeNCs in solution at ambient pressure and relatively low temperature. The resulting GeNCs can be stabilized in different type of ligands. Upon excitation with visible wavelength laser, a photoluminescence effect is observed. This indicates the presence of quantum confinement effect, which is attributed to large Bohr exciton radius of GeNCs.

Current works include characterization of GeNCs and an in depth study of the effect of different ligands.

*Solution synthesized GeNCs. Diameter ranges from 3-10 nm.*

*Photoluminescence of GeNCs demonstrates quantum confinement effect*