Developing Novel Organic-Inorganic Hybrid Nanomaterials

Masaki MATSUBARA

Assistant professor matubara@sendai-nct.ac.jp

Affiliated Societies The Chemical Society of Japan, The Society of Nano Science and Technology

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Research Topics

- Development of liquid crystalline organic-inorganic hybrid dendrimers
- Quantum dot-based superlattices and their photoluminescence behavior
- Low-temperature sintering of metal nanoparticles

Research Seeds

Because of the rapid progress of nanotechnology in recent years, various synthetic methods related to nanoparticles and fine particles have been developed. Various nanoparticles suitable for application can be prepared easily. In the development of such nanomaterials, the contribution of the interface, which is a contact point between the material and the surrounding phase, becomes extremely large. The surface protective layer properties strongly affect the material functions. Therefore, to maximize the superior performance of nanomaterials, appropriate design for surface modification and structure, and precise control thereof are extremely important. Widely various knowledge related to interfaces is becoming necessary. In particular, studies of "organic-inorganic hybrid materials" that combine organic and inorganic materials having opposite properties to develop synergistic and associative functions, require more accurate functional predictions.

We have developed "Liquid-Crystalline Organic-Inorganic Hybrid Dendrimers" (Fig. 1) by hybridization of liquid crystalline organic dendrons and spherical inorganic nanoparticles to introduce self-assembling properties derived directly from dendrons into nanoparticles so that they spontaneously form a self-organized three-dimensional long period structure. Furthermore, precise design and synthesis of materials from the viewpoints of both organic materials and inorganic materials enable us to produce synergistic functional organic-inorganic hybrid nanoparticles such as low-temperature sintering metal nanoparticles and inks and polymer-grafted nanoparticles with miscibllity into resins and plastics. Nanostructure analyses are also characterized using transmission electron microscopy (TEM) and small angle X-ray scattering (SAXS).

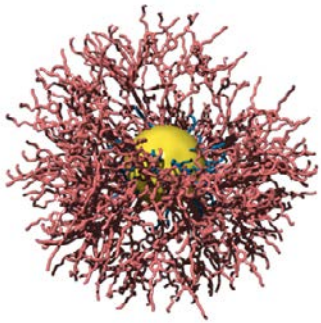

Fig. 1 A schematic of "Liquid-Crystalline Organic-Inorganic Hybrid.

Related Technology

- Nanoparticle Syntheses
- Transmission Electron Microscopy (TEM)
- Small Angle X-ray Scattering (SAXS)