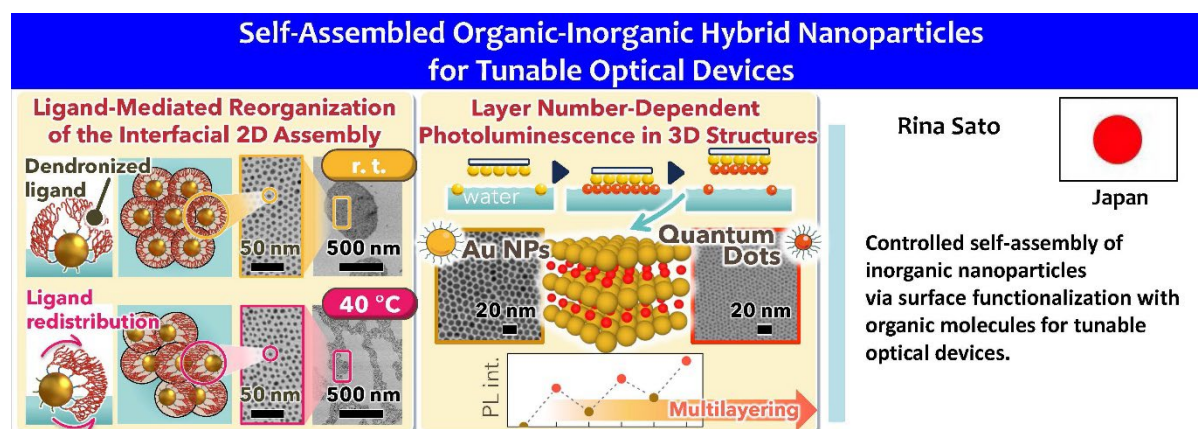


<Research Topics>

Self-Assembled Organic-Inorganic Hybrid Nanoparticles for Tunable Optical Devices

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■ Research

For inorganic nanoparticles such as semiconductor quantum dots and metal colloids, effects of “surfaces” are more pronounced than for bulk materials. Their physical properties are thus highly sensitive to interparticle interactions, which are governed by the distance between neighboring nanoparticles.

My research aims to control the optical properties of inorganic nanoparticles by constructing two- and three-dimensional ordered structures through the self-assembly of organic ligands on nanoparticle surfaces. For example, if nanoparticle arrangements can be dynamically reorganized, this could enable switching of assembly-dependent properties and open the way to stimuli-responsive materials.

Controlling the collective functions of nanoparticles is also crucial for high-performance optoelectronic devices based on quantum dots. For instance, reducing interparticle distances in thin films is expected to improve charge transport. However, the collective behavior of nanoparticles within only a few nanometers remains insufficiently understood.

Through the precise control of interparticle distances using self-assembly, my research seeks to clarify distance-dependent properties and create rationally designed nanomaterials.

■ Comments

I joined ICYS right after completing my PhD last year. What I appreciate most about ICYS is that it provides a stimulating environment where we can step away from our doctoral research topic and focus on a research plan based on our own original ideas. At NIMS, researchers have access not only to state-of-the-art facilities that allow them to fully materialize their ideas, but also to support from experts in a wide range of instruments, who assist with experiments and analyses. In addition, there are many opportunities to receive feedback from researchers with diverse backgrounds, such as through annual research presentations to tenured NIMS researchers, as well as seminars and workshops with ICYS members.

I believe ICYS offers a truly valuable environment for young researchers to establish their originality and take the next step in their future careers.

■ Link

<https://www.nims.go.jp/icys/research/#R.SATO>