Synthesis and Application of Mesoporous Oxide Nanoparticles Using Supercritical Fluids

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1. Objective

This project is aimed at:

Investigating new aspects of inorganic-organic hybrid nanomaterials and their applications in the fields such as chemistry, materials, medicine and energy. We have succeeded in preparing spherical mesoporous metal oxide nanoparticles by means of a quite simple one-pot single-step procedure with a very sort reaction time (<10 min). The morphologies of the nanomaterials are easily controlled by simple treatment to afford core-shell, yolk-shell, surface-attached, and doping with rare earth and noble metals. These nanomaterials have unique morphologies and properties, and will enable extensive contributions to nanomaterial science.

2. Project Outline

To that end, the project will consist of the following phases:

(a) The creation of new inorganic-organic hybrid nanomaterials.
(b) Application to catalysts for chemical reactions.
(c) Creation of higher-order nano-composites including nanoparticles.

3. Expected Performance

In this project, the successful candidate would be expected to:

(a) Synthesize inorganic-organic hybrid nanomaterials.
(b) Perform property analysis of nanomaterials.

4. Required Skills and Knowledge

The successful candidate for this project will have the following knowledge and skills:

(a) Knowledge of synthetic organic chemistry and inorganic chemistry.
(b) Skills to operate XRD, SEM, and TEM.

References

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(2) P. Wang, H. Takigawa, K. Ueno, and K. Kobiro, *J. Supercrit. Fluids*, **78**, 124–131 (2013). doi: 10.1016/j.supflu.2013.03.023
(3) P. Wang and K. Kobiro, *Chem. Lett.,* **41**, 264–266 (2012). doi:10.1246/cl.2012.264

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