Curriculum Vitae

<table>
<tr><td>Name</td><td colspan="3">Tomohiko OKADA</td><td rowspan="6">  </td></tr>
<tr><td>Nationality</td><td>Japan</td><td>Age</td><td>38</td></tr>
<tr><td>Date of Birth</td><td>25-Nov-‘75</td><td>Sex</td><td>M</td></tr>
<tr><td>Affiliation</td><td colspan="3">Shinshu University</td></tr>
<tr><td>Position</td><td colspan="3">Associate Professor</td></tr>
<tr><td>Address</td><td colspan="3">4-17-1 Wakasato, Nagano 380-8553</td></tr>
<tr><td>Telephone</td><td>+81-26-269-5414</td><td>Fax</td><td colspan="2">+81-26-269-5424</td></tr>
<tr><td>E-mail</td><td colspan="4">tomohiko@shinshu-u.ac.jp</td></tr>
<tr><td>Biography</td><td colspan="4">Education:
1999 Bachelor, Department of Earth Sciences, Waseda Univ.
2001 Master; 2004 Doctor (Sci.), Department of Resources and Environmental Engineering, Waseda University
(Director: Prof. Makoto OGAWA)

Academic carriers:
2004-2006 Research Associate, Waseda Univ.
2006-2015 Assistant Prof. Shinshu Univ.
2015-(at present) Associate Prof. Shinshu Univ.

Recent publications:
Okada, T., et al., Langmuir, 31, 180 (2015).
Okada, T., et al., J. Mater. Chem. A, 2, 5751 (2014).
Okada, T., et al., ACS Catal., 4, 73 (2014).
Okada, T., et al., J. Phys. Chem. C, 116, 21864 (2012).
Okada, T., et al., Chem.-Asian J., 7, 1980 (2012). <review>

Awards:
2008 Encouragement Award of Clay Mineral Society of Japan
2011 Encouragement of Research in Thin Films in The 15th International Conference on Thin Films

Research Interests:
Silica-based hybrid materials for possible applications as adsorbents, catalysts, separation, and sensors.
Morphology: spherical (including hollow) particles and fibers;
Components: layered silicates, Brønsted acid, magnetic particles, etc.;
Technique: emulsion, sol-gel, hydrothermal.</td></tr>
</table>

Silica-based functional core-shell microspheres

Tomohiko Okada *
Department of Chemistry and Material Engineering, Faculty of Engineering, Shinshu University, Nagano 380-8553, Japan
*Email: tomohiko@shinshu-u.ac.jp

Precisely controlled nanostructure and morphology are important in the fabrication of materials with such abilities as adsorption of a particular molecule, sensing, and the controlled release.[1,2] Our group has investigated the surface modification of colloidal spherical silica particles, including monodisperse spheres, magnetic core-shell particles for such practical uses.

We have been interested in adsorptive properties of the layered silicates including clay minerals for uptake of an organic molecule.[3] Homogeneous deposition of layered silicates on monodisperse spherical silica has been achieved, producing core-shell particles of a layered silicate (shell) on silica microspheres (core); colloidal monodisperse spherical silica particles acted as a sacrificial template in the presence of sources of the silicates (Li and Mg salts) and urea at 373 K.[4-6] As a result the layered silicate was firmly glued onto the silica particles. Intercalation of cations into the layered silicate on the silica was demonstrated without flaking off the silicate layers from the product.

We have occluded functional nanoparticles into hollow organosilica microspheres using the sol-gel reactions of alkylsilyl trichlorides around water droplets in a water-in-oil emulsion.[7-11] Metallic cobalt[7,8,10] and magnetite[11] nanoparticles was encapsulated into the hollow particles to give a magnetically collectable, reusable adsorbent and catalyst for concentrating heavy metal ions in acidic aqueous solutions and solid acid catalysis in aqueous media. Sulfonic groups, that acted as adsorption sites for Zn and Pb ions under an acidic condition, were immobilized on the external surface through silylation with 3-mercaptopropyl(trimethoxysilane) and subsequent oxidization of the thiol groups by 7 M HNO_3. The adsorbent was regenerated using 1 M HCl without eroding the magnetic nanoparticles.

References

[1] T. Okada, et al., *Chem.-Asian J.*, **2012**, *7*, 1980.
[2] T. Okada, et al., *J. Nanosci. Nanotech.*, **2014**, *14*, 2135.
[3] (a recent example): Okada, T., et al., *Langmuir*, **2015,** *31,* 180.
[4] T. Okada, et al., *J. Phys. Chem. C*, **2012,** 116, 21864
[5] T. Okada, et al., *Microporous Mesoporous Mater.,* 10.1016/j.micromeso.2015.05.018.
[6] T. Okada, et al., *Clay Sci.*, in press.
[7] T. Okada, et al., *Chem. Lett.*, **2012,** *40,* 106.
[8] T. Okada, et al., *J. Appl. Phys.*, **2013,** *114,* 124304.
[9] T. Okada, et al., *ACS Catal.*, **2014,** *4,* 73.
[10] T. Okada, et al., *J. Mater. Chem. A*, **2014**, 2, 5751.
[11] T. Okada, et al., *Ind. Eng. Chem. Res.*, **2014,** 53, 8759.