

Aerosol-assisted synthesis of mesoporous organosilica microspheres with controlled organic contents

Yusuke Yamauchi *et al* 2009 *Sci. Technol. Adv. Mater.* **10** 025005 (9pp) doi: [10.1088/1468-6996/10/2/025005](https://doi.org/10.1088/1468-6996/10/2/025005) [Help](#)

[Full text](#) [PDF \(2.06 MB\)](#) | [References](#)

[Yusuke Yamauchi](#)^{1,2}, [Norihiro Suzuki](#)¹, [Prashant Gupta](#)^{1,6}, [Keisuke Sato](#)¹, [Naoki Fukata](#)^{1,2}, [Miwa Murakami](#)³, [Tadashi Shimizu](#)^{1,3}, [Satoru Inoue](#)⁴ and [Tatsuo Kimura](#)⁵

¹ World Premier International (WPI) Research Center for Materials Nanoarchitectonics (MANA), National Institute for Materials Science (NIMS), 1-1 Namiki, Tsukuba, Ibaraki 305-0044, Japan

² PRESTO, Japan Science and Technology Agency (JST)

³ Advanced Nano Characterization Center, NIMS, 3-13 Sakura, Tsukuba, Ibaraki 305-0003, Japan

⁴ Nanoceramics Center, NIMS, 1-1 Namiki, Tsukuba, Ibaraki 305-0044, Japan

⁵ Advanced Manufacturing Research Institute, National Institute of Advanced Industrial Science and Technology (AIST), Shimoshidami, Moriyama, Nagoya 463-8560, Japan

⁶ Present address: Department of Civil and Environmental Engineering, Indian Institute of Technology (IIT), Kanpur, India.

E-mail: YAMAUCHI.Yusuke@nims.go.jp

Abstract. Periodic mesoporous organosilica (PMO) spherical particles with different organic contents were synthesized in one pot by reacting 1,2-bis(triethoxysilyl)ethane (BTSE) with tetraethylorthosilicate (TEOS) using a spray-drying technique. The scanning electron microscopy observation of spray-dried products clearly showed the formation of spherical particles. The ²⁹Si magic angle spinning nuclear magnetic resonance data revealed that the organic contents due to ethane fragments embedded in the frameworks were controllable and consistent with the BTSE/TEOS molar ratios of precursor solutions. Transmission electron microscopy, small-angle x-ray scattering, and N₂ adsorption data of PMO with controlled organic contents indicated that the ethane fragments were embedded in the frameworks with the formation of ordered mesostructures. PMO with a high organic content (BTSE/TEOS=0.50) only showed a hydrophobic property. According to the same procedure, benzene groups were also integrated to a similar degree in the frameworks by using 1,4-bis(triethoxysilyl)benzene.

Keywords: aerosol-assisted synthesis, mesoporous material, surfactant, triblock copolymer, organosilica, sol-gel process, silica, hybrid material

Print publication: Issue 2 (April 2009)

Received 22 March 2009, accepted for publication 10 June 2009

Published 14 July 2009

[BOOKMARK](#) [Post to CiteUlike](#) | [Post to Connotea](#) | [Post to Bibsonomy](#)

Find related articles

By author

▼

[j n IOP](#)

[j n CrossRef Search](#)

Article options

[E-mail this abstract](#)

[Download citation](#)

[Add to Filing Cabinet](#)

[Create e-mail alerts](#)

[Recommend this journal](#)

Authors & Referees

[Author services](#) **NEW**

[Submit an article](#)

[Track your article](#)

[Referee services](#)

[Submit referee report](#)



[Journals Home](#) | [Journals List](#) | [EJs Extra](#) | [This Journal](#) | [Search](#) | [Authors](#) | [Referees](#) | [Librarians](#) | [User Options](#) | [Help](#) | [Recommend this journal](#)

Setup information is available for [Adobe Acrobat](#).

EndNote, ProCite® and Reference Manager® are registered trademarks of ISI Researchsoft.

[Copyright](#) © Institute of Physics and IOP Publishing Limited 2010.

Use of this service is subject to compliance with the [Terms and Conditions](#) of use. In particular, reselling and systematic downloading of files is prohibited.

Help: [Cookies](#) | [Data Protection](#) | [Privacy policy](#) | [Disclaimer](#)