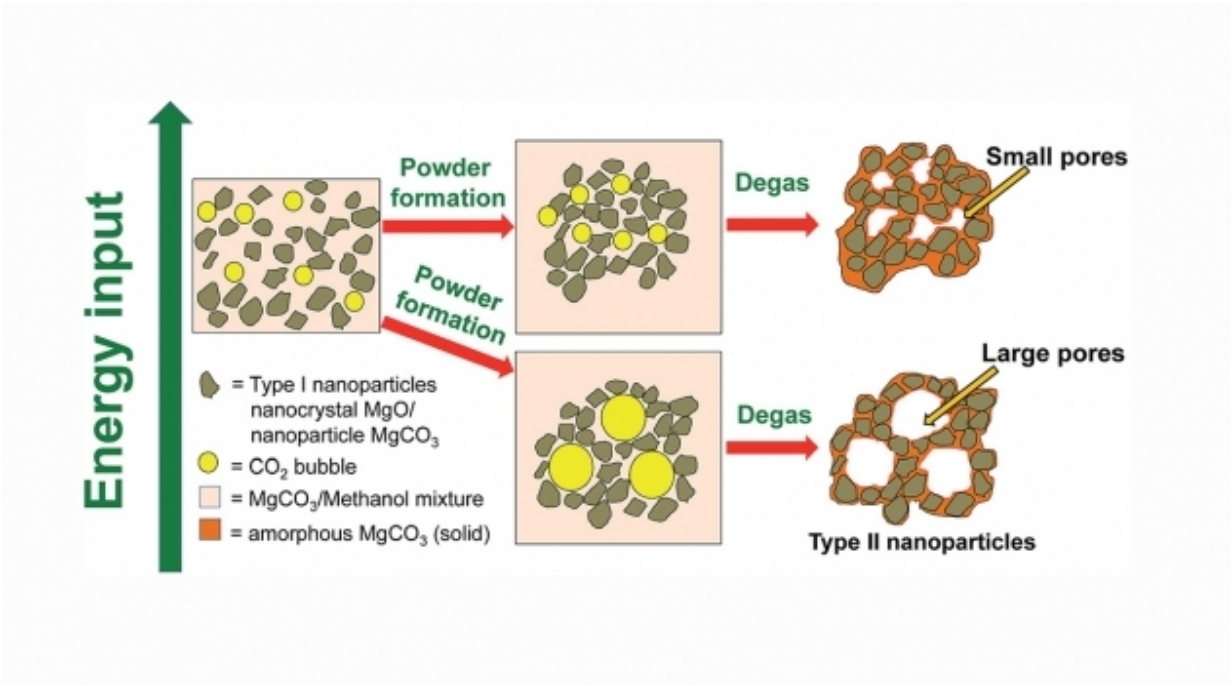
New approach to drug development with Upsalite

August 9 2016, by Annica Hulth



Schematic representation of the mechanism and energy input (e.g. temperature or stirring) dependence related to the pore formation of the mesoporous material. Credit: Uppsala University

For the first time, researchers have revealed the nanostructure of the mesoporous magnesium carbonate Upsalite and pore size control was achieved without organic templates or swelling agents. By controlling the pore structure of the material the amorphous phase stabilisation exerted

on poorly soluble drug compounds can be tuned and the drug delivery rate can be tailored.

After the invention of the scanning tunnelling microscope in 1981, the discovery of the fullerenes in 1985, and Drexler's dystopian presentation of nanotechnology in his 1986 book Engines of Creation, nanomaterials have made their entrance in most of the materials development industries.

An important class of nanomaterials is the mesoporous materials having pores with diameters between 2 and 50 nm (nanometres). Such materials are developed for applications including delivery of medicines and vaccines, regeneration of bone tissue, chromatography, catalysis as well as for moisture adsorption and gas separation. For such applications it is important to be able to tailor the pore structure of the material and until now this has been achieved by using organic template molecules or swelling agents that need to be removed at high temperatures before the material can be used.

In a publication presented in *RSC Advances*, researchers from the division of Nanotechnology and Functional Materials at Uppsala University in collaboration with researchers from Stockholm University for the first time show that it is possible to tailor the pore structure of a mesoporous material, Upsalite, without using organic templates or swelling agents, and instead by merely controlling the energy input in the production process. This greatly simplifies the synthesis of mesoporous materials and is thus expected to become important for industrial up-scaling.

In addition the researchers show that the amorphous phase stabilisation properties, as well as the release rate, of the poorly soluble antifungal drug itraconazole could be tuned by adjusting the pore size of Upsalite.

`This finding opens up for new possibilities to stabilise the vast number of poorly soluble substances in the R&D pipe-line of big pharmaceutical companies´, says Maria Strömme, Professor of Nanotechnology at Uppsala University.

More information: Ocean Cheung et al. Nanostructure and pore size control of template-free synthesised mesoporous magnesium carbonate, *RSC Adv.* (2016). DOI: 10.1039/C6RA14171D

Provided by Uppsala University

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