

Hollow Mesoporous Silica Nanostructures: Synthesis and inclusion in rubber compounds

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Abstract

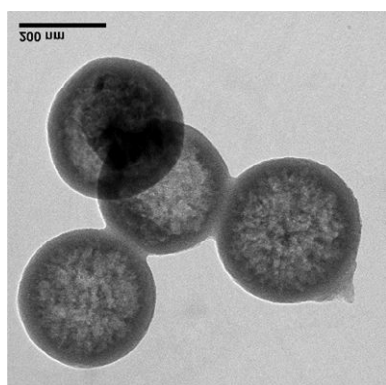
Hollow mesoporous silica nanostructures (HMSN) have attracted much attention due to their interesting properties such as large surface area, low density, excellent mechanical and thermal stability, low toxicity, high biocompatibility and high drug loading capacity. For all this, HMSN have been used in many areas for the design of applications in catalysis, drug storage and release, reinforcing of polymers, etc.

HMSN can be obtained through two main strategies namely, hard-template and soft-template methods. The hard-template method consists of the fabrication of a sacrificial template followed by the deposition of a mesoporous silica shell and final removal of the core template. On the other hand, in the soft-template method emulsion droplets act as template for silica growth. In this context, we have systematically developed the synthesis of different HMSN through, the above mentioned methods, employing tetraethyl orthosilicate (TEOS) as the silica source and hexadecyltrimethylammonium bromide (CTAB) as surfactant. We have studied how several changes of the reaction conditions, such as concentration of reagents, solvents, catalyst or temperature, affects to the morphology and properties of HMSN.

The synthesized HMSN, have been integrated in rubber compounds as reinforcing agents, providing clear advantages in tear strength, abrasion, heat resistance, hardness, high modulus, etc.

Figures

HMSN (soft- templated method)



HMSN (hard- templated method)

