

Accepted Manuscript

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PII: S0266-3538(17)30107-0

DOI: [10.1016/j.compscitech.2017.01.008](https://doi.org/10.1016/j.compscitech.2017.01.008)

Reference: CSTE 6630

To appear in: *Composites Science and Technology*

Received Date: 14 December 2015

Revised Date: 6 October 2016

Accepted Date: 12 January 2017

Please cite this article as: Li J, Ma J, Jiang T, Khan F, Wang Y, Chen Y, Yan B, Liu S, Combined membrane emulsification with biomimetic mineralization: Designing and constructing novel organic-inorganic hybrid microspheres for enzyme immobilization, *Composites Science and Technology* (2017), doi: 10.1016/j.compscitech.2017.01.008.

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Combined membrane emulsification with biomimetic mineralization: Designing and Constructing novel organic-inorganic hybrid microspheres for enzyme immobilization

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Abstract

The organic-inorganic hybrid composites displayed great potential for biotechnological and biomedical application. In this research, a novel and facile method for preparing organic-inorganic hybrid microspheres was developed by a synergy of membrane emulsification and biomimetic mineralization. The gelatin solution (water phase) was mixed with the liquid paraffin (oil phase) at 60 °C and a coarse W/O emulsion was produced by magnetic stirring. The coarse emulsion was extruded through a Shirasu Porous Glass (SPG) membrane, and then was slowly dropletted into the pre-hydrolyzed tetraethoxysilane (TEOS), which acted as silicon precursor. The biomimetic mineralization was occurred *in situ* under the catalysis of gelatin, while silica was formed around the gelatin emulsion droplets, resulting in the final gelatin/silica hybrid microspheres. These microspheres were characterized by a variety of techniques, including SEM, TEM, EDS, TGA/DTA, and DSC. The gelatin/silica hybrid microspheres present a mass fraction of the inorganic

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