

## Journal Pre-proofs

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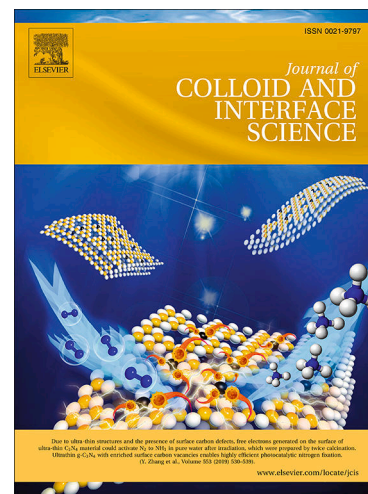
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## Salt-Driven Assembly of Magnetic Silica Microbeads with Tunable Porosity

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### Abstract

#### *Hypothesis*

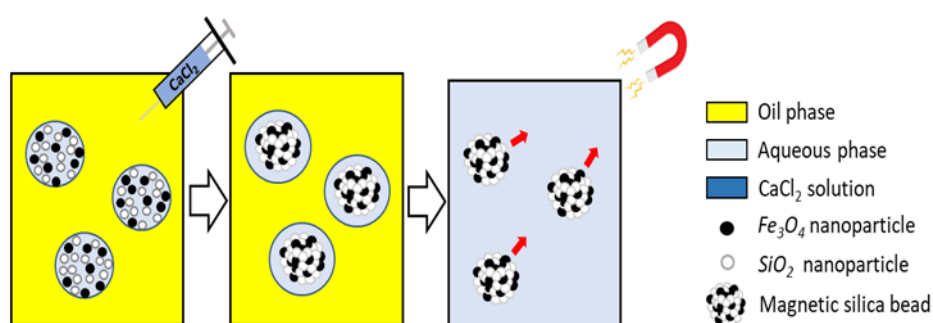
Porous magnetic silica beads are promising materials for biological and environmental applications due to their enhanced adsorption and ease of recovery. This work aims to develop a new, inexpensive and environmentally friendly approach based on agglomeration of nanoparticles in aqueous droplets. The use of an emulsion as a geometrical constraint is expected to result in the formation of spherical beads with tunable composition depending on the aqueous phase content.

#### *Experiments*

Magnetic silica beads are produced at room temperature by colloidal destabilization induced by addition of  $\text{CaCl}_2$  to a water-in-oil emulsion containing  $\text{SiO}_2$  and  $\text{Fe}_3\text{O}_4$  nanoparticles. The impact of the salt concentration, emulsification method, concentration of hydrophobic surfactant as well as silica content is presented in this paper.

#### *Findings*

This method enables the production of spherical beads with diameters between 1 and 9  $\mu\text{m}$ . The incorporation of magnetic nanoparticles inside the bead's structure is confirmed using Energy Dispersive X-ray spectrometry (EDX) and Scanning Transmission Electron Microscopy (STEM) and results in the production of magnetic responsive beads with a preparation yield up to 84%. By incorporating the surfactant Span 80 in the oil phase it is possible to tune the roughness and porosity of the beads.



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