

# SYNTHESIS, CHARACTERISATION AND SENSING PERFORMANCE OF IMIDAZOLIUM FUNCTIONALISED MESOPOROUS MATERIALS USING ALANINE SURFACTANT DERIVATIVES WITH DIFFERENT TAIL LENGTHS

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Mesoporous molecular materials with a regular pore order were first noticed in 1992 by Mobil Oil Corporation investigators. These materials have a pore size range from 2 to 50 nanometers and have interesting properties like large surface area, uniform pore volume and pore size distribution, all of them very attractive properties for applications in catalysis, adsorption, pollution elimination and polymer-made matrix filler for gas separation<sup>1</sup>.

The use of solid porous materials as active agents has received much attention in novel sensing protocols<sup>2</sup>. Silica-based MCM-41 type materials have been the most common solids used for these purposes.

Functionalization of silica materials with organic groups of these large surface solids is a common strategy in order to fine tune the interaction with specific samples or some polymeric matrices, as this property provides to this materials a wide range of applications<sup>1</sup>.

The method used here to synthesize mesoporous materials is by the co-condensation route. Co-condensation allows the synthesis and polymerization of silica in a one-step reaction with organic groups uniformly distributed both inside the pores and over the surface.<sup>3,4,5</sup> Particularly, a method developed by Che et al.<sup>6</sup> based on the use of anionic surfactant and a positively charged silane derivative has been used.

In this work, we show our efforts to prepare and characterize stable ordered porous silica based solids using alanine surfactant derivatives and imidazolium silanes derivatives as CSDA. This method provides a high surface density of imidazolium pendant moieties, whose proximity and permanent electrostatic positive charge, independent of the pH value, provides a suitable host to carry out sensing activities for anions.

Several anionic surfactants were used in this work, all of them keeping the same small aminoacid as a headgroup (alanine) but we studied the variation of the length of the tails of surfactants from a hydrocarbon chain of 12 carbons into 14, 16 and 18 C. The reason for this variation lies in the subsequent variation of the ratio known as surfactant packing parameter or simply *g*-parameter<sup>7</sup>.

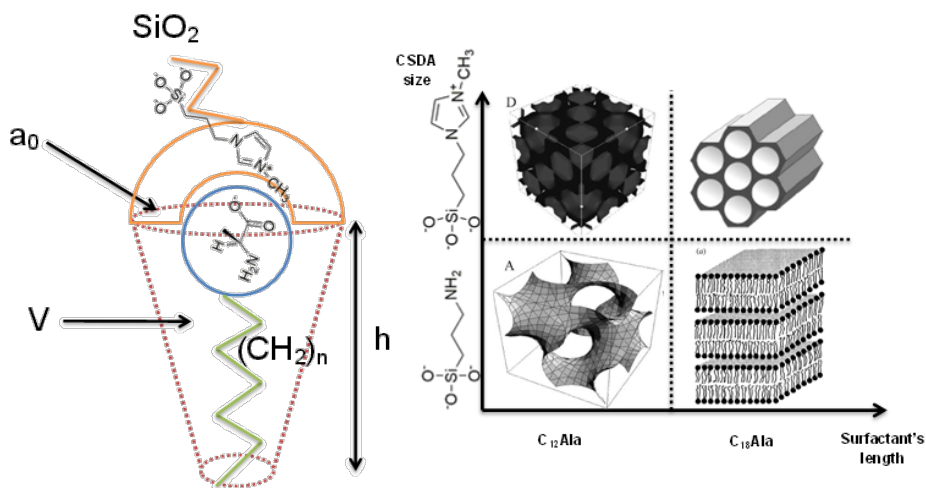


Figure 1. Definition of surfactant packing parameter  $g$  and structural variations.

The definition of this parameter is  $g=V/a_0h$ . By changing the  $g$ -parameter the geometry and topology of the mesopores is modified too according to Figure 1.

Stability of the structures will be examined with the extraction of the surfactants, and materials will be characterised with X-ray diffraction, nuclear magnetic resonance, thermogravimetric assays, IR spectroscopy and adsorption isotherms.

We assess the sensing performance by loading the solids with a dye and measuring the ability for different anions to displace the dye, which is then measured by UV-vis spectroscopy. Presumably, selectivity towards some analytes between different structures obtained with different surfactants will be variable as it depends on the pore size, distance between binding sites, analyte size and electrostatic affinity.

#### References

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