

You are cordially invited to attend this seminar to be held on

Tuesday, June 5th, 15:00

Room 206, Wolfson Mechanical Engineering Building

Strategies for the Syntheses of Functional Nanoporous Materials

Dr. Maria Castro

Life is organised in a hierarchical order: lower levels of organization are progressively integrated to make up higher levels. A major goal in materials science is to control the hierarchical organization of functional solids from the atomic to the macroscopic scale. This arrangement provides unique catalytic, electronic, optical and magnetic properties. Zeolites are an important example among such materials.

Zeolites are functional crystalline nanoporous materials being one of the most important heterogeneous acid catalysts used in industry. Nevertheless, their use is limited as a result of the diffusion limitation due to the sole presence of micropores. Hence there is an increasing need for new hierarchical zeolitic materials to target the ongoing needs i.e. biorefinery.

Nowadays, zeolite formation remains poorly understood, and therefore, the synthesis of zeolites requires extensive efforts by trial and error. Little is known about species involved in the prenucleation and nucleation step during solid state formation from solution, and especially for zeolite nucleation. According to classical nucleation theory (CNT) these processes are prenucleation, nucleation and crystal growth, each of interest not only for the synthesis of functional materials but also in such diverse fields as biomineralization or cloud formation. Understanding the principle formation processes is an important step towards rational synthesis.

In this talk I will present

- i) synthetic strategies capable to tailor new zeolitic materials focusing on the relationship between structure and performance and
- ii) a toolbox enabling the observation of the molecular mechanisms involved in the formation of a hierarchical zeolite from solution and gel.

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My main focus is on materials science, the synthesis and characterization of inorganic and hybrid nanoporous materials, with special interest in the most suitable characterization techniques to monitor the formation of these materials for best performance in specific applications for catalysis and adsorption. In addition, one of my recent interests is the investigation of the mineral-microbial interface for novel biotechnological applications and the origin of life. I obtained my PhD in 2010 supervised by Prof. P. A. Wright at University of St. Andrews, Scotland, funded by a Marie Curie Scholarship. Title of Thesis: 'Templating Approaches to the Synthesis of New Microporous Materials for Gas Adsorption and Separation'. As postdoctoral research fellow at the Max Planck Institute for Coal Research, Germany. I took up an exciting challenge to investigate the elementary processes during solids formation.