

Zeolite Crystal Engineering: A Multiscale Approach

Jean-Pierre GILSON

Normandie Université, ENSICAEN, UNICAEN, CNRS
Laboratoire Catalyse et Spectrochimie (LCS), 14000 Caen, France

After setting the scene of the current energy and materials transition, I will highlight the challenges facing zeolites in the future. The LCS strategy to meet these challenges, Zeolite Crystal Engineering, will then be outlined.

This strategy basically takes place at three different scales:

- i) *Sub-nm and nm level*: this is the domain of active sites & point defects (nature, location, confinement...) and microporosity
- ii) *μm level*: this is the domain of the size, shape and morphology of particles, the meso- & macro-porosity...
- iii) *mm level*: this is the domain of shaped bodies as zeolites are never used in commercial processes as unprocessed powders

These 3 scales will be illustrated by case studies on:

- i) preparation of defect-free zeolites and introduction of transition metal ions in their framework
- ii) the mosaic structure of zeolites and the opening of inaccessible zeolite cages
- iii) the chemical reactions taking place during the extrusion of zeolite with an alumina binder