

## **A unified NMR view of silicates from zeolites to ionic liquids**

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Silicates represent a considerable technological and scientific issue from geology to nanomaterials. Among them zeolites are an essential societal issue, impacting about 20% of the mondial economy, directly or indirectly. Formation of nanoporous or dense silicates phases undergoes different chemical or physical states, and are of utmost importance. NMR is a spectroscopic method allowing to assess at a very local scale, chemical or physical state of matter, structure of liquids or of crystalline or amorphous solids and allows to investigate crystallization processes in a unique way.

Nucleation, growth of crystals are challenging issues to understand most of geochemical, chemical or crystallogensis formation of solids from the speciation of molecular state in liquids. NMR can access to structural, topological aspects of crystals, without the constraints of periodic boudaries conditions, liquids an solids state stuctural organization. This represents a unique way to access analytical, speciation or molecular formation of crystals.

NMR represents a unique way to link the differents stages of organization from oligomerization to crystal formation. In-situ, ex-situ NMR characterization bring structural and dynamical organization of density flucutuations.

As an archetype of silicate chemistry, zeolites formation will be reformulated. Elementary condensation steps will be identified and distinguished carefully, avoiding technical jargon, and favouring phsyco-chemical general concepts.

As NMR can access solid state, crystalline or amorphous order, from oligomerization to nanoaggregation and crystalline order, an unified view of the successive condensation elementary steps of silicates formation will be presented. Such a enumeration of the progressive organization of condensed matter from silicic acid to the most complex zeolites may give rise to enumerate many different processes with a common knowledge and language between vastly different scientific and technological disciplins.