Phase transitions at the nanoscale: develoment of thermoporosimetry as a multi-scale tool for the characterization of complex materials

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Porous materials are omnipresent in nature and find various industrial applications. Numerous biological processes also involve such porous materials making them the object of abundant studies. The characterization of porosity is therefore a crucial issue.
Gas sorption and mercury intrusion porosimetry are probably the most popular techniques. Thermoporosimetry (TPM) has also been proposed as an alternative[1,2]. TPM relies on the Gibbs-Thomson equation which relates the shift of the transition temperature of a confined liquid ΔT to the radius of the pore in which it is confined.

This technique is particularly attractive because it offers the possibility to characterize porosity from the mesopore range up to the macroporous domain within a single experiment. It is also very unique because it allows the characterization of inorganic materials but also polymers and hybrids.

We will present recent developments of the technique in particular the first true calibration of TPM within the macropore range by using hierarchically porous hybrid materials[3].
Several examples will be taken illustrating the potential of TPM for the characterization of complex materials processed by sol-gel chemistry.

The chosen examples will cover a wide range of applications from biomaterials[4] to environmental remediation and catalysis.

[1] New calorimetric approaches to the study of soft matter 3D organization
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Fields of Research
Sol-gel chemistry; soft chemistry; Porous materials; Bioceramics; Confinement effect in materials

Recent Publications

New calorimetric approaches to the study of soft matter 3D organization
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