The architectured materials such as the fibrous, the cellular, micro or nanostructured are widely used in numerous technological domains today (fuel cells, heat exchangers, turbines, solar thermochemical reactor, radiant burners, wind turbines, heat transfer insulation). Besides their very lightness, these materials present very interesting not only thermal but also mechanical properties. They can be used as multifunctional materials.

Our scientific objectives are to better understand and to model from mesoscopic scale the effective thermal properties (conduction, radiation, convection) but also mechanical behavior of architectured materials.

One of the key points of these works, especially for the cellular materials is that they lean on models of the architecture of materials based on two approaches developed in parallel the one is based on models of polyhedral cells (pentagon, dodecahedron) or Voronoï cells and the other one on meshings generated from tomography X analysis. The models of thermal and mechanical properties developed allow to take into account the complexity of the foam morphology, they are based on a more and more realistic description of the sub-structure of this materials.