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Bio-based aerogels as eco-friendly alternatives to synthetic polymer-based foams

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Room Pedferri, Building 6
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live | online

link will be emailed to registered participants

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Aerogels are ultra-light, highly porous materials characterized by a large specific surface area, which makes them excellent candidates for absorbing media, energy storage, or thermal insulation applications. Among the different types, inorganic silica aerogels are the most studied. However, silica aerogels are limited by their brittleness and low compressive properties. In general, these materials are difficult to make and harmful to the environment because of their long degradation time in nature and the large amount of solvent used in the preparation process. Therefore, new environmentally acceptable and sustainable approaches are urgently needed.

Biomass aerogels have attracted wide attention due to their excellent thermal insulation properties, but their low mechanical strength and high susceptibility to combustion limit their application. To address these limitations, in our laboratory, robust all-natural aerogel composites have been obtained by incorporating nanoscale montmorillonite and tannic acid into different matrixes using water as solvent and applying the freeze-drying method. The prepared aerogels exhibited low densities, good compressive properties, and low thermal conductivities. Under fire, the systems exhibited excellent flame retardancy with reduced thermal degradation rate. In this presentation, the relationships between the generated structures and the final properties will be analyzed. These multifunctional composite aerogels are considered promising eco-friendly alternatives to synthetic polymer-based foams.

Miguel Sánchez Soto is full Professor at the Materials Science Department of the Universitat Politècnica de Catalunya (Barcelona- Spain). Miguel's research interests include the thermo-mechanical characterization of polymers and composites, the reduction of carbon footprint through the lightweighting of components, and the application of advanced polymer processing technologies. Currently his research is focused on the manufacture and properties optimization of aerogels made from natural and renewable resources focusing in improving the mechanical properties, thermal insulation and resistance to fire. He has authored or co-authored over 150 publications and holds 3 patents. He has taking part in 31 national and international competitive research projects as well as in 36 research projects with private companies. Miguel earned his Ph.D. in Industrial Engineering from the Universitat Politècnica de Catalunya. Barcelona Tech.