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# Inorganic, hybridized and living macrocellular foams: "Out of the box" heterogeneous catalysis through the integrative chemistry input

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We will show how when combining chemistry and the physical chemistry of complex fluids, we can trigger the design of highly efficient heterogeneous catalysts. We will thus focus the topic on 3D-Macrocellular monolithic foams bearing hierarchical porosities and applications thereof toward heterogeneous catalysis where both activities and mass transport are enhanced. We will first depict the overall synthetic path, focusing on concentrated emulsions and lyotropic mesophases, acting as soft templates at various length scales. We will see how we can design cellular materials being either, inorganic, carbonaceous, hybridized or living ones where heterogeneous catalysis applications are addressed while considering respectively acidic, metallic, enzymatic or bacterial processes. Along, we will demonstrate how the fluid hydrodynamic, the low molecular hindrance and the easiest accessibility occurring within these foams are offering advanced "out of the box" heterogeneous catalysis whatever acting in batch, on-line or when dedicated toward cascade-type chemical reactions. Finally, we will depict the first $CO_2$ photo-reduction process acting in volume and not on the surface anymore, enhancing electronic density, minimizing foot-print penalty as well as back-reactions.

## Biography

Renal Backov obtained his PhD in 1997 at the University of Montpellier II, France. After being Associate Researcher at the University of Florida, to address inorganic chemistry, he was hired as Associated Professor at the University of Bordeaux in 2001 while being full Professor since 2010. He is currently invited Professor at the MIT. With more than 140 articles, 35 patents and 350 contributed papers, his field of research encompasses the domains of energy conversion (hydrogen storage, batteries, biofuel cells), drug delivery, sensors, heterogeneous catalysis (enzymatic, metallic, bacteriologic), photocatalysis, photonics and beyond.

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