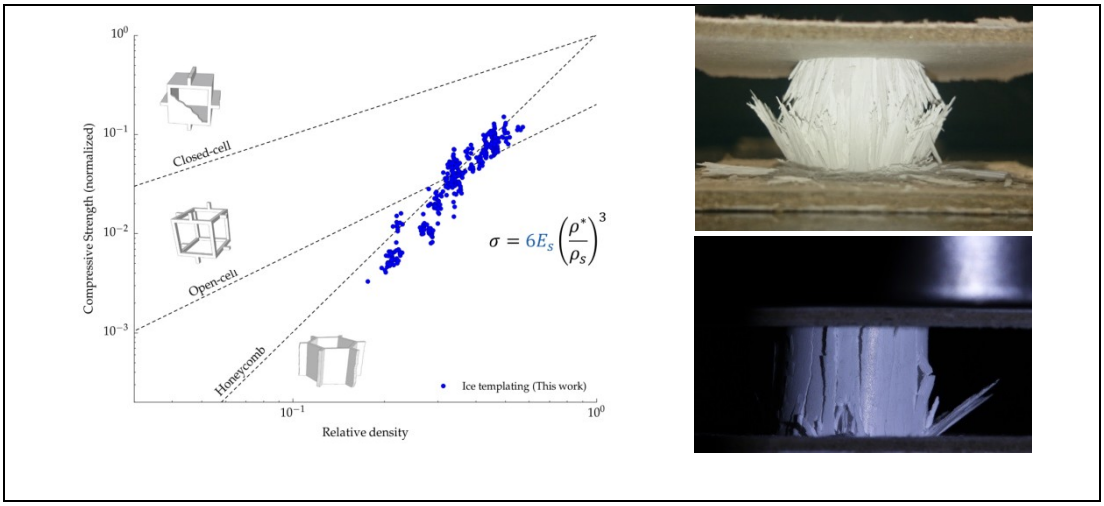
Structure Property Relations in Anisotropically Porous Ceramics

Adam Stevenson, Jordi Seuba, and Sylvain Deville

Laboratoire de Synthèse et Fonctionnalisation des Céramiques (LSFC)

Saint-Gobain CREE

Cavaillon, FRANCE



Macroporous ceramics are widely used in applications such as filtration, thermal insulation, scaffolds for tissue engineering, solid oxide fuel cells, or oxygen transport membranes. They must combine mechanical stability with at least one other functional property such as high permeability, low thermal conductivity, or biocompatibility. Microstructural parameters such as porosity, pore size, shape, or tortuosity, can become crucial to maximize the performance while maintaining high strength. The purpose of this work is to tailor the pore architecture of specimens processed by ice-templating and determine the main microstructural parameters that control the compressive strength, mechanical reliability, and air permeability of unidirectional porous materials. Furthermore, the applicability of mechanistic and gas flow models will be discussed in the context of the structured pore morphologies. Finally, we will provide some guidelines to produce tubular ice-templated samples with controlled porosity.

Bio

Adam Stevenson has been a research scientist in the Ceramic Synthesis and Functionalization Laboratory at Saint-Gobain CREE since 2011. There, he researches the links between processing, microstructure, and properties in ceramic materials. Adam obtained his PhD in 2010 from the Pennsylvania State University where he worked on transparent ceramics for laser applications under Professor Gary Messing. Before joining Saint-Gobain, Adam was a post-doc at Ecole Nationale Supérieure de Chimie de Paris where he developed processing methods for Yb:CaF_2 ceramic laser materials.