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.
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