

John van Geuns Foundation lecture

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Porous Ceramics – From Bulk to Nanofibers

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Abstract

Generation of porous ceramics has been an objective of much research for decades. The size and structure of the porosity are of key importance to different applications such as catalysis, filtration, adsorption and thermal insulation. This talk will concentrate on the origin and mechanism porosity formation, driven by in-situ chemical transformations in two systems.

Firstly, the formation of ultralight bulk ceramics using a non-hydrolytic sol-gel will be described. This method involves a unique foaming mechanism based on simultaneous phase separation, gelation and drying, yielding highly porous alumina and mulite. Such materials can serve as efficient, fiber-free thermal insulation at high temperatures.

Secondly, the talk will focus on mesoporous nanofibers of Fe-Al-O made by electrospinning. Such fibers are of great interest in heterogeneous catalysis since they can facilitate superior transport to and from the catalytic sites. Providing the fibers with internal nano porosity can increase the catalytic surface and improve their performance.

Both examples will demonstrate how internal chemical transformation can generate controlled porosity in functional ceramics.