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Statistical Mechanics of Pore Self-Ordering in Porous Alumina[1]

ARIEF BUDIMAN, DANIEL LO, University of Calgary — Porous alumina has been used as natural templates in forming various ordered nanostructures and has also a potential as catalysts or molecular sieves. Optoelectronic applications typically require a perfect spatial pore ordering, while chemical applications demand less ordering. More recently, pore self-ordering has also been observed in other material systems. A general framework to understand the self- ordering is still lacking. We will focus on the filled hexagonal lattice of pores in porous alumina and describe their pore-ordering by their elastic interaction and their configurational entropy using cluster variation method. Phase diagrams describing the location of ordered and disordered phases as functions of interpore distance, surface tension, and temperature are obtained.

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