

Abstract Submitted  
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**Thermodynamic Analysis of Nanoporous Membrane Separation Processes**<sup>1</sup> DAVID ROGERS, SUSAN REMPE, Sandia National Laboratories — We give an analysis of desalination energy requirements in order to quantify the potential for future improvements in desalination membrane technology. Our thermodynamic analysis makes it possible to draw conclusions from the vast array of equilibrium molecular dynamics simulations present in the literature as well as create a standardized comparison for measuring and reporting experimental reverse osmosis material efficiency. Commonly employed methods for estimating minimum desalination energy costs have been revised to include operations at positive input stream recovery ratios using a thermodynamic cycle analogous to the Carnot cycle. Several gaps in the statistical mechanical theory of irreversible processes have also been identified which may in the future lead to improved communication between materials engineering models and statistical mechanical simulation. Simulation results for silica surfaces and nanochannels are also presented.

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