

Abstract Submitted
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High Temperature Solid–Solid Transition in Ammonium Chloride Confined to Nanopores¹ REZA FARASAT, BENJAMIN YANCEY, SERGEY VYAZOVKIN, University of Alabama at Birmingham — Differential scanning calorimetry was employed to measure the temperature and thermal effect of the solid-solid phase transition in ammonium chloride confined to silica matrices with pore sizes ranging from 4 to 30 nm. Ammonium chloride was loaded from aqueous solutions. The concentration and number of loads were varied to control the pore fullness, which was defined as a fraction of the filled volume to the total available volume of the nanopores. Assuming cylindrical pore shape, the pore fullness was used to estimate the height of the layer deposited on the pore walls. Thermogravimetric analysis was employed to evaluate the pore fullness, which was further used to estimate the height of ammonium chloride layer deposited inside the pores. With increasing the layer height, the heat of transition increased toward the bulk value. Relative to the bulk value, the transition temperature measured on heating and on cooling respectively increased and decreased with decreasing the layer height. It was concluded that a strong interaction with the nanoconfining medium may have a larger effect on the behavior of a nanoconfined substance than the effect of nanosize alone. The temperature dependencies of the effective activation energy derived from isoconversional kinetic analysis of DSC data have been parametrized in terms of the Turnbull–Fisher model. It was found that the transition in the pores encounters a larger free energy barrier to nucleation.

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