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Glass softening, crystallization, and vaporization of nano-aggregates of Amorphous Solid Water: Fast Scanning Calorimetry studies[1] DEEPANJAN BHATTACHARYA, LIAM O'REILLY, VLAD SADTCHENKO, The George Washington University — Despite intense efforts, complete understanding of relationships between various condensed phases of water remains an elusive goal. In particular, the molecular kinetics and phase transitions of water in confining geometries (e.g., nano-scale films) are of special interest due to the relevance to environmental and biological processes. With the objective of gaining insights into fundamental distinctions in physical and chemical properties of confined water, we have developed an experimental approach which relies on rapid (10^5 K/s) heating of nanoscale films of Amorphous Solid Water (ASW) prepared by vapor deposition in vacuum at cryogenic temperatures. With recent advances, the approach, Fast Scanning Calorimetry (FSC), facilitates studies of glass softening, crystallization, and vaporization of ASW films with thicknesses down to two nanometers. Unlike bulk samples, the thermograms of ultrathin ASW films show two endotherms at 40 and 10 K below the onset temperatures of crystallization. We will report the conclusion of our analysis of the FSC thermograms of nanoscale ASW aggregates, and discuss the implications of these studies for developing better models of molecular kinetics of water in confining geometries.

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