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SAXS on ice crystals reveals fractal structure on nanometer length scales JESSE HOPKINS, RYAN BADEAU, MATTHEW WARKENTIN, ROBERT THORNE, Cornell University — We have used small angle x-ray scattering (SAXS) to probe ice formation in supercooled aqueous solutions and water. The SAXS shows that the ice formed in supercooled aqueous solutions and water has power law behavior that is invariant across a wide range of solute type, concentration, and temperature. We interpret this power law as scatter from fractal structures in the ice. The consistency of this power law across four different solutes and in pure water, and at temperatures between 150 K and 220 K suggests an underlying similarity between macroscopically/visually different forms of ice on length scales of 10-100 nm. Time dependent SAXS curves reveal two scattering regimes, one occurring at early times and one dominating at later times, which we interpret within the context of fractal scatterers. Finally, we use scaling collapses on the data to extract information about the time and temperature dependence of the ice growth. We interpret this within the established framework of the ice nucleation and growth community.

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