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Amorphous Solid Water (ASW): Macroscale Environmentally-Neutral Application for Remediation of Hazardous Pollutants using Condensed-Phase Cryogenic Fluids RONALD DE STRULLE, HPI; Pace Univ., Dept. Chem & Phys Sci., MAXIMILIAN RHEINHART, HPI; Spacetime Inst. — We report macroscale environmentally-neutral use of cryogenic fluids to induce phase transitions from crystalline water-ices to amorphous solid water (ASW). New IP and uses in remediation of oil-spills and hazardous immiscibles from aquatic environments. We display high-resolution images of the transitions from hexagonal to cubic crystalline water-ice, then to hydrophobic ASW. Accretion and encapsulation of viscous pollutants within crystalline water-ice, and sequestration of condensed volatiles (PAH, methane) and low viscosity fluids within the interstitial cavities of ASW are shown and differentiated for: crude oils, diesel (heating) and blended oils, petroleum byproducts, vegetable and mineral oils, lipids, and light immiscible fluids. The effects of PdV work and thermal energy transfers during phase changes are shown, along with the sequestration efficiencies for hexagonal and cubic ice lattices vs. non-crystalline ASW, for a range of pollutant substances. The viability of ASW as a medium for study of quantum criticality phases is also proposed. The process is environmentally-neutral in that only substantially condensed-phase air liquefaction products, e.g. nitrogen in >90% liquid phase are employed as an active agent. The applications are also presented in terms of the scale-up of experiments performed at the nanoscale.

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