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Supressed Water Crystallization in Nano-Structured Physical Hydrogel CLINTON WIENER, BRYAN VOGT, ROBERT WEISS, Univ of Akron — Suppressed water crystallization occurs in some organisms, such as the common wood frog, which allows it to hibernate in a frozen state without damage to its cells. Knowledge of the behavior of supercooled water and alternate ice forms may have many implications to many fields of science. Supercooling of water by several degrees below the normal freezing point is often observed in hydrogels that have attractive interactions with water, e.g., hydrogen bonding. Repulsive confinement, such as in hydrophobic porous carbon, can have even more significant effects on the supercooling of the entrapped water. This talk describes the freezing behavior in nano-structured, hydrophobically modified poly(dimethyl acrylamide) hydrogels that possess attractive and repulsive interactions with water and are physically crosslinked by hydrophobic nanodomains. Three distinct water freezing regimes were observed in the hydrogel swollen to about 50% water by weight. Differential scanning calorimetry detected three crystallization exotherms at 254K, 244K, and 227K. Quasi-elastic neutron scattering experiments have shown that although the water mobility was suppressed at room temperature, the water remained significantly mobile below the normal freezing point of water. The talk will discuss how tuning the concentration of the hydrophobic composition of the hydrogel affects the porous length scales in the hydrogel, which may alter the state of water and the crystal form produced by supercooling.

Clinton Wiener
Univ of Akron

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