



**Figure S1.** Schematic representation of the freezing conditions used in this work. (a) Unidirectional (UD) freezing condition. The polypropylene syringe containing the hydrogel is mounted on the top surface of a metallic aluminum bar which is placed vertically into ice/NaCl bath at  $-20^{\circ}\text{C}$  to allow a vertical freezing gradient across the sample. (b) non-directional (ND) freezing, the polypropylene syringe containing the hydrogel is placed in a freezer at  $-23^{\circ}\text{C}$  to allow isotropic freezing of the sample.