## Supporting Information



Figure S1: The temperature change of Peltier stage from RT to -50°C outside the ESEM.



Figure S2: Measurement of the average diameter of ice spheres.



Figure S3: The temperature change at point 1 (see Figure 5A) caused by the PE beam power at three different beam currents (initial temperature -21.06°C corresponds to the temperature of the frozen droplet after approximately 390 seconds when the PE beam is turned on).

Video 1: Dynamic sublimation of ice from sample shown in Figure 6. Scale bar = 100 µm.

Video 2: Static observation of frozen droplet shown in Figure 9 (upper row). Scale bar = 100 µm.