Supporting information

Distinguishing Amorphous and Crystalline Ice by Ultralow Energy Collisions of Reactive Ions

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**Figure S1.** Stopping potential experiment of CH$_3^+$ performed at Q1. Inset shows the results of the same experiment performed at Q3. A schematic of the experiment is shown in another inset.
Figure S2. Stopping potential experiment of CH$_4^+$ performed at Q1. Inset shows the scheme of the experiment.
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Figure S3. Mass spectra observed upon the collision varying energy of CH$_4^+$ on 100 ML ASW (D$_2$O) generated at 120 K.
**Figure S4:** Mass spectra observed after collision of varying energy CH₂⁺ projectile on crystalline ice (D₂O) made after annealing of the amorphous ice layer.
Figure S5: Mass spectra recorded upon collision of ultralow energy (1-10 eV) CH$_2^+$ ion on condensed 1-pentanol grown on amorphous ice (D$_2$O). CH$_2^+$ ion colliding with 1, 2, 3, 5, 8, 10 eV kinetic energy is shown here. Inset shows the sputtering spectra upon the collision of 50 eV Ar$^+$ ion on the substrate.