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Accretion growth of water-ice grains in astrophysically-relevant dusty plasma experiment KIL-BYOUNG CHAI, RYAN MARSHALL, PAUL BELLAN, Caltech — The grain growth process in the Caltech water-ice dusty plasma experiment has been studied using a high-speed camera equipped with a long-distance microscope lens. It is found that (i) the ice grain number density decreases four-fold as the average grain length increases from 20 to 80 um, (ii) the ice grain length has a log-normal distribution rather than a power-law dependence, and (iii) no collisions between ice grains are apparent. The grains have a large negative charge so the agglomeration growth is prevented by their strong mutual repulsion. It is concluded that direct accretion of water molecules is in good agreement with the observed ice grain growth. The volumetric packing factor of the ice grains must be less than 0.25 in order for the grain kinetic energy to be sufficiently small to prevent collisions between ice grains; this conclusion is consistent with ice grain images showing a fractal character.

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