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**Nucleation, growth, and dynamics of water-ice grains in laboratory plasmas** PAUL BELLAN, KIL-BYOUNG CHAI, Caltech — An rf discharge with $LN_2$ cooled electrodes has been used to study nucleation, growth, and dynamics of water-ice grains spontaneously formed in weakly ionized H, D, He, Ne, Ar, or Kr plasmas. Ice grain nucleation occurs only when plasma exists and its density is below a critical value that is proportional to ambient gas pressure. Nonspherical, fast grain growth occurs when the water molecule mean free path exceeds the ice grain screening length corresponding to molecules incident on the ice grain having collisionless trajectories. Up to 10:1 elongated ice grains have been observed. Ice grains grow larger in lighter gas plasmas and in particular grow up to 500 $\mu$m long in H plasma. Magnetic fields sufficiently strong to make the electron gyro radius smaller than the ice grain screening length impede nonspherical growth by reducing the charge residing on water-ice grains. Ice grains are aligned along the sheath electric field and rotate about their alignment axis with $\sim 10^2$ Hz angular frequency. Dust acoustic waves are observed in low pressure, low rf power plasmas.

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