

# **Laboratory Studies of Thermal and Non-thermal Processes on and in Growing Icy Grain Mantles.**

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A synthesis observations from laboratory studies on the thermal and non-thermal physics and chemistry of dust grains as they evolve from diffuse to dense environments in the interstellar medium will be presented. We will specifically report on (1) thermal desorption and the impact of surface heterogeneity; (2) agglomeration of water (H<sub>2</sub>O) on an amorphous silica (aSiO<sub>2</sub>) surface; (3) highly efficient electron-promoted desorption of weakly bound adsorbates from H<sub>2</sub>O ice surfaces; (4) photo-desorption from H<sub>2</sub>O ice surfaces at ultraviolet wavelengths in the 200 to 300 nm range; and (5) efficient molecular hydrogen (H<sub>2</sub>) generation from ionisation of reduced carbon-containing species. The conclusion drawn from this synthesis is that the onion model of icy grain mantles needs revision.