PRELIMINARY DUST COLLISION EXPERIMENTS WITH ASTROPHYSICAL DUST GRAIN ANALOGS AND MOLECULES AT VERY LOW TEMPERATURES

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Introduction: Solar system chemistry is heavily dependant on ion, photon, electron and dust collisions. Such collisions on the surfaces of icy satellites, e.g. Europa, play an important role in molecular synthesis [1, 2]. Planets and their moons are constantly subjected to irradiation from both their respective planetary magnetospheres and the solar wind. Such processes can be simulated in the laboratory [3].

Laboratory experiments to simulate the radiation chemistry of astrophysical grains and molecular ices were carried out under ultra-high vacuum (UHV) conditions and at very low temperatures ~10 K [3]. In-situ preparations of molecular ices on grain surfaces under such conditions provides useful analogs of surface ice present on icy bodies such as Ganymede.

Low Temperature Collision Experiments: Here we present the preliminary results of new experiments on dust and electron irradiation of grain surfaces and molecular ices at very low temperatures. We use different synthetic grain types, including silica (SiO_2) and phosphorous pentoxide (P_2O_5). We chose P_2O_5 as a sensible analog for phosphorous oxide (PO), which has recently been discovered in the interstellar medium [4]. The synthetic ices, generated as mantles on the dust grains, include O and N. The electron radiation is supplied via a commercial electron gun and operates at 1 KeV, while the dust particles are accelerated to 15 KeV via a purpose-built apparatus. We expect that such collisions will generate new chemical species akin to those observed on icy bodies and planets in the solar system as well as in the interstellar medium.

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