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Coagulation of Dust – Collisions in the Decimetre Range

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Planets are formed by accretion of km-size protoplanetary bodies. Dust agglomerates play a major role in the formation process of these planetesimals [1]. They either evolve from dust agglomerates through coagulation, or they form by gravitational instabilities in highly dense parts of the protoplanetary disc. Decimetre size dust agglomerates play a crucial role in both models, as they are direct precursors for the critical meter-size bodies and can easily be trapped in vortices, where critical particle densities can be reached to enable gravitational collapse[2]. Therefore it is important to investigate the collision properties of the decimetre size agglomerates. Especially the threshold conditions for fragmentation are important for coagulation models. In our experiment we investigated the collisions of decimetre size dust agglomerates of equal size and porosity. The experiments were carried out in the drop tower in Bremen under microgravity conditions at pressures of < 0.01 mbar. Collisions were observed with two high-speed cameras at velocities from 7 cm/s to 26 cm/s. We will present first results of the microgravity experiments and a first analysis of the fragmentation conditions and collision dynamics for dust agglomerates in the critical decimetre range at low velocities.

[1] J. Blum and G. Wurm, Annual Review of Astronomy & Astrophysics, Volume 46, Issue 1, pp.21-56 (2008)

+ [2] Johansen et al., Nature, Volume 448, Issue 7157, pp. 1022-1025 (2007)

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