GROWTH OF PLANETESIMALS AT HIGH IMPACT VELOCITIES G. Wurm, O. Krauß, and G. Paraskov, Institute for Planetology, University of Münster, Germany

Introduction: Particles in a protoplanetary disk frequently collide with other particles. Planetesimal formation by this process takes place if the collisions result in the net growth of a larger (more massive) body. Collision velocities range from fractions of a mm/s up to 100m/s. While the low velocities result in sticking the question is if growth at the larger velocities can occur, i.e. at speeds above several tens of m/s. It looks like no collision of two bodies alone can do this. Erosion or fragmentation of the larger body is always the result. However, the collisions take place in a gaseous disk. In the collision of a larger body with a smaller one the large body experiences a head wind in which the small body is entrained. Fragments of the collision can get entrained again and be returned to the large body this time at a reduced velocity. Sticking and reaccretion of fragments would occur. This eventually leads to a net growth instead of erosion.

The mechanism has experimentally been proven to work with small dust aggregates for velocities above 10m/s [1][2][3]. Thus growth of bodies much larger than 10cm in protoplanetary disks can be explained quite naturally without any special assumption. This is one step further in the growth sequence. However, probably this is not yet enough e.g. to explain the formation of m-sized or larger bodies.

With respect to our previous experiments there is still room to change parameters though by which we expect to get net growth at higher speeds. This essentially concerns the morphology of the dusty particle assemblies and the sizes involved. We will present a follow up experiment which will verify if this mechanism (termed by us aerodynamical sticking) also works at higher velocities for larger bodies. In the experiment we call WHALE (Wind Hatched Planetesimals in Laboratory Experiments) collisions of dusty bodies are studied in a low pressure high speed wind channel designed for this purpose.

Our recent first measurements look promising but this qualitative statement still has to and will be substantiated by more experiments and a more detailed analysis.

References: [1] Wurm G., Blum, J., and Colwell, J.E. (2001) *Phys. Rev. E*, 64, 046301 1-9. [2] Wurm, G., Blum, J., and Colwell, J.E. (2001) *Icarus*, 151, 318-321. [3] Blum, J. and Wurm, G. (2001) *Microgravity Science and Technology*, 13, 29-34.