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Photophoresis at the edge of protoplanetary disks: chondrule sorting and collisional growth, vertical transport and particle rotation.

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Photophoresis acts on solid particles in optical thin parts of protoplanetary disks. These include the inner edge [1] of the disk and its optical surface. In laboratory experiments and numerical models we quantified the strength of photophoresis on chondrules. We find that dust mantled chondrules can efficiently be size sorted at the edge of the disk [2]. In this optical thin but dense environment subsequent collisional growth is likely. In a different set of experiments we find that the rotation axis is aligned with the direction of radiation and the general photophoretic strength is not reduced by particle rotation [3]. The particles (micrometer sized ice) are levitated by means of photophoretic forces based on thermal radiation. This suggests that vertical transport in protoplanetary disks and along the surface is one possible way of transporting matter from the inner to the outer system.

[1] Haack, H. and Wurm, G. (2007) Meteorit. Planet. Sci. Suppl., 42, 5157. [2] Loesche, C. and Wurm, G. (2012) A&A, 545, A36. [3] Van Eymeren, J. and Wurm, G. (2012) MNRAS, 420, 183.

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