PHOTOPHORETIC PARTICLE LIFT AND TRANSPORT IN THE SOLAR NEBULA BY THERMAL AND OPTICAL RADIATION: LABORATORY EXPERIMENTS. G. Wurm¹, T. Kelling¹, and J. Teiser¹, ¹Institut für Planetologie, Wilhelm-Klemm-Str. 10, D-48149 Münster, Germany. E-mail: gwurm@uni-muenster.de.

Photophoretic transport: Ample evidence exists in meteorites and other samples of the solar system that radial transport of matter in the solar nebula was a widespread phenomenon. Over the last few years photophoresis has been proposed as one such transport mechanism [1, 2, 3, 4]. Photophoresis is a force imposed on a solid particle if the particle is illuminated, usually by a directed (non-isotropic) radiation which heats the particle.

So far, applications are based on theoretical estimates of the photophoretic force. To determine the strength of photophoresis, only typical particle properties have been assumed and calculations. These have been carried out for homogeneous, spherical, perfectly light absorbing, non rotating particles. The physics of photophoresis for more realistic particles is largely unknown. Our aim is to measure the photophoretic force on particles relevant for the solar nebula (dust aggregates, chondrules and CAIs).

With respect to stellar radiation, photophoresis induced by visible light is of interest. However, also the thermal radiation of the solar nebula itself is important for particles at the surface of the disk and might result in a photophoretic lifting force [4]. The lift enables support for particles which then can be transported along or above the surface of the solar nebula.

Laboratory Experiments: We started to measure the photophoretic force on particles in laboratory experiments. In the drop tower Bremen photophoresis by visible light on chondrules, dust mantled chondrules and dust aggregates have been studied under microgravity [5]. These studies show that the photophoretic force on chondrules is within the range of the simplified assumptions made and that particle rotation does not prevent photophoresis. In a new ground based laboratory setup we started to analyze the photophoretic force on dust aggregates trapped by or subject to thermal radiation.

We will present the details of the experiments, current results and especially the new experiments on thermal (and visible) photophoresis on dust aggregates.