

Ion-Induce nucleation experiment I: development of a new apparatus

WATANABE, Naoki^{1*}; HIDAKA, Hiroshi¹; NAKAI, Yoichi²; KOJIMA, Takao³

¹Institute of Low temperature Science, Hokkaido University, ²Nishina Center, RIKEN, ³Atomic Physics Laboratory, RIKEN

Mechanisms of grain nucleation have attracted researchers in various fields of science in connection with e.g. atmospheric aerosols and cosmic dust grains. Although there have been many theoretical and experimental works approaching this issue, the details of nucleation mechanism is still in debate. Most of works are performed assuming homogeneous nucleation in gas phase or heterogeneous nucleation on the bulk surfaces. The homogeneous nucleation often suffers from a "critical size" of particle and requires high supersaturation condition to gain the efficient formation rate, while the nucleation on the bulk surface may not be relevant to the first stage of grain formation in realistic environments. It is known that ion-induced heterogeneous nucleation would play an important role in the particle formation because in this mechanism ion-neutral interaction overcomes difficulties expected in neutral-gas-phase homogeneous nucleation. We recently developed a new experimental apparatus to investigate the elementary process of the ion-induced nucleation. We present the importance of ion-induced nucleation and advantages of the newly developed apparatus. Using this apparatus, we have been successful in obtaining an important physical parameter, free energy, of water cluster ions.

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