Formation of high-density amorphous ice by matrix sublimation method

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Various methods for the preparation of amorphous ice have been developed to investigate the relationship between its structure and method of formation (Fig.1). However, unknown amorphous ice may still be discovered through new formation method.

A new method for the formation of amorphous ice has been developed. First, CO-rich ice mixture ($CO:H_2O$ ice) was deposited at around 10 K. Then, ice mixture was warmed-up. After the sublimation of CO matrix at around 35 K, amorphous ice remained. We observed these process by ultra-high vacuum transmission electron microscope and Fourier transform infrared spectrometer. The amorphous ice formed shows highly porous texture, but it is high-density form similar to high-density amorphous ice formed under high pressure. The high-density amorphous ice is stable up to 140 K, where it transforms directly to ice Ic.

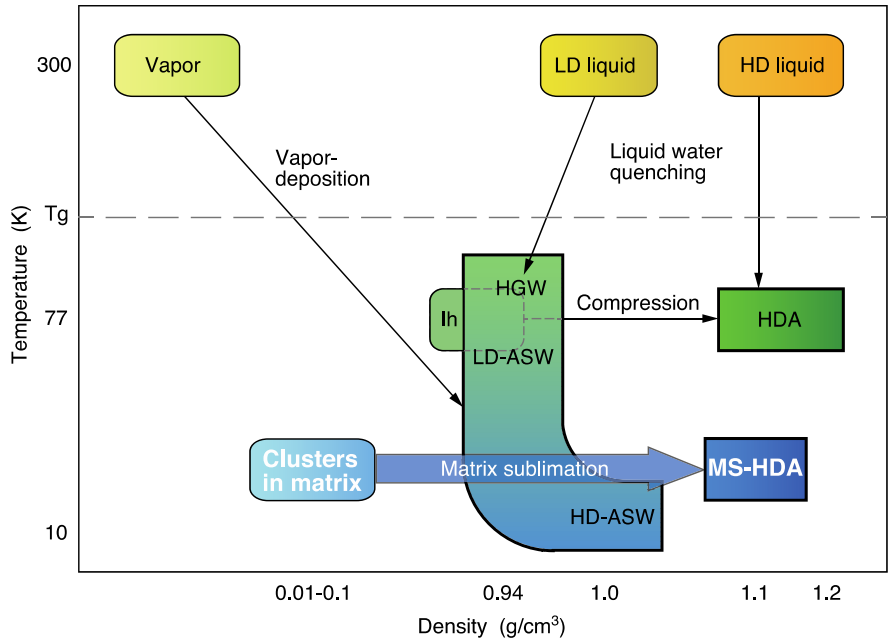

Figure 1: Schematic temperature-density diagram for the formation of amorphous ices. The starting materials are shown in rounded rectangles, formation routes as arrows with name of methods, and products in rectangles.

References

[1] A. Kouchi, T. Hama, Y. Kimura, H. Hidaka, R. Escribano & N. Watanabe, 2016, Chem. Phys. Lett., 658, 287.