Falling and collision of ^{4}He crystals in superfluid

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Detailed crystal shape of ^{4}He during a free falling was investigated in superfluid by a high speed video camera. A ^{4}He crystal was nucleated by a ultrasound transducer on the top of a sample cell and the crystal fell in the superfluid and collided with the bottom. During the falling, upper surface of the crystal became rough and lower surface became facetted. This is possibly caused by the superflow around the crystal which induced the melting in the upper surface and the crystallization in the lower surface. When it collided with the bottom, pulse-like wave traveled around the surface from the contact point and the crystal transformed itself quickly to adjust to a new boundary condition. We also investigated how crystals fell when a small needle was placed in the falling path. The crystal surface was drawn and stretched by the needle. This strange interaction between the crystal and the needle is probably induced by the superflow around the crystal but is not well understood at present. Collisions of two ^{4}He crystals were also observed and the smaller crystal was melted and taken into the larger one after the collision.

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