Interface Motion and Nucleation of ^{4}He Crystal Induced by Acoustic Waves

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The acoustic radiation pressure is an effective driving force for the crystal-superfluid interface motion of ^{4}He. We found crystallization was induced at low temperature by applying an acoustic wave pulse to the interface from the crystal side. Recently, very fast growth of the (0001) surface of a hcp 4He crystal was observed as shown in Fig.1 [2]. The image was taken by a high-speed camera which operated at a rate of 1 msec/frame. The growth velocity cannot be explained by the spiral growth mechanism for the known value of the step mobility. We developed a new step multiplication model for the facet growth by application of high-power acoustic waves.

We also present visual observation of the nucleation of ^{4}He crystal by acoustic waves [1]. When an acoustic wave pulse was applied to superfluid ^{4}He which is slightly over-pressurized above the melting pressure, ^{4}He crystal was nucleated on a piezoelectric transducer. This phenomenon is interpreted that an acoustic radiation pressure pushes a surface of a remnant seed crystal on a wall and that the crystal grows to a macroscopic size.

[1] H. Abe *et al*., J. Phys. Soc. Jpn., Vol.**75** No.2**,** 023601 (2006).
[2] H. Abe *et al*., Phys. Rev. B, **71,** 124506 (2005).

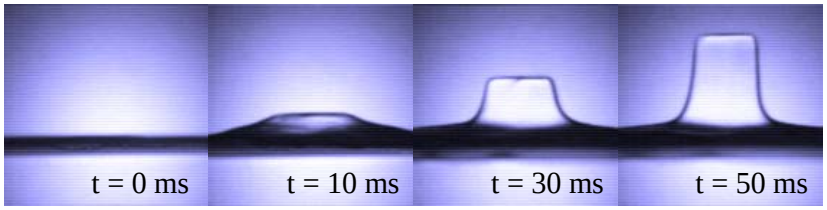

FIG.1: Growth shape of the c-facet taken by a high-speed camera at T = 200 mK. Pulse duration was 50 ms. Diameter of the c-facet was 3 mm at t = 50 ms.