Fluctuating surfaces of growing ^{4}He crystals in aerogel

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Crystallization of ^{4}He in aerogel was shown to exhibit a dynamical transition in the growth mode: crystals grow via creep at high temperatures and via avalanche at low temperatures. It was also found from both crystallization rate and nucleation probability measurement that crystals grow via thermal activation in the high-temperature creep region and via macroscopic quantum tunneling in the low-temperature avalanche region[1]. In the growth regime via quantum tunneling avalanche size distribution follows a power low and indicates that the system is in a self-organized critical state (SOC)[2]. It is interesting that ^{4}He in aerogel can provide a good system to study the fundamental physics of crystal growth. In this report we focus on the shape of the growing interface in the high-temperature creep region and attempted to analyze the roughness of interfaces. The growth of rough interfaces is commonly observed in nature and the roughness is known to often follow a scaling low; roughness usually increases with time and saturates in the later stage. We measured the width $w(t)$ defined as the standard deviation of the interface height as a function of time t. It was found that $w(t)$ in 98 percent porosity aerogel nitially increased with t and decreased after a particular time in the later stage. The abrupt reduction of roughness in the end of crystallization is unusual. The possible interpretation is under consideration.

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