



中心系列讲座 ICQM Weekly Seminar Series

Solid Helium: Supersolidity or Plasticity?

Eunseong Kim

**Korea Advanced Institute of Science and
Technology**

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Venue: Room 607, Conference Room A, Science Building 5

地点: 理科五号楼607会议室

Abstract

Recent observation of anomalous shear modulus increase at low temperature raises a question: whether or not one can also explain the missing rotational inertia, originally interpreted as probable observation of supersolidity (or non-classical rotational inertia, NCRI), in solid helium with mechanical stiffening of solid helium without invoking superfluidity. According to the non-supersolid model, the temperature dependent viscoelasticity of the solid and the resultant shear modulus change could be responsible for the suppression of the resonant period. Here

I will present simultaneous measurements of shear modulus and torsional oscillator (TO) response on solid helium grown in a single torsion cell. The most compelling observation is the change in the elastic modulus does not affect the period of TO, which contradicts to the non-supersolid explanation of viscoelasticity. We also find that NCRI can be reduced in very low stress fields in which ^3He impurities are still bound to dislocation lines, indicating that supersolidity can be suppressed by different excitations from that of the shear modulus increase. Thus, the NCRI does not have identical origin as the stiffening of solid helium, despite the remarkable similarities between two phenomena.

About the speaker

Dr. Eunseong Kim observed the first phenomena which were interpreted as supersolid behavior in 2004 with Moses Chan. In 2008, Dr. Kim was awarded the Lee Osheroff Richardson Science Prize for his contributions to the understanding of solid helium. Being famous as an experimental low temperature physicist, Dr. Kim joined Korea Advanced Institute of Science and Technology in 2006 and have been continuously contributing to his field.