



Contribution ID: 629

Type: Oral (Non-Student) / orale (non-étudiant)

Probing helium mass flow through a solid-liquid-solid double Junction

Friday, 19 June 2015 09:15 (15 minutes)

Recent experiments by Hallock and coworkers [1] observed mass transport through solid ^4He and suggested it was due to flow along dislocation lines. In those measurements, helium was injected and removed through Vycor “electrodes” filled with superfluid ^4He . Here, we report the results of a related experiment: a Vycor rod filled with superfluid ^4He is sandwiched between two bulk solid regions. By compressing solid ^4He on one side and measuring pressure changes on the other, we can detect flow through the Vycor, without necessarily having flow through the solid. In high pressure crystals we saw no flow below 1 K but in samples below 28 bar we observed flow down to the lowest temperatures (below 20 mK). The temperature dependence of this flow was very similar to that of the flow seen in previous experiments [1]: it began around 600 mK, increased as the temperature was reduced, then decreased dramatically at a temperature which depended on ^3He impurity concentration (around 75 mK for standard isotopic purity samples). We suggest that flow in solid ^4He experiments is limited by mass transfer through the solid-liquid interface at the Vycor ends. This project is funded by NSERC Canada and by ERC (AdG 247258-SUPERSOLID).

[1] Phys. Rev. Lett. 105 145301 (2010); Phys. Rev. Lett. 113, 035302 (2014).

Primary author: Dr CHENG, Zhigang (University of Alberta)

Co-authors: Dr FEFFERMAN, Andrew (Laboratoire de Physique Statistique de l'ENS); Dr SOURIS, Fabien (Laboratoire de Physique Statistique de l'ENS); Dr BEAMISH, John (University of Alberta); Dr BALIBAR, Sebastien (Laboratoire de Physique Statistique de l'ENS)

Presenter: Dr CHENG, Zhigang (University of Alberta)

Session Classification: F1-1 Networks and complex systems (DCMMP) / Réseaux et systèmes complexes (DPMCM)

Track Classification: Condensed Matter and Materials Physics / Physique de la matière condensée et matériaux (DCMMP-DPMCM)