



Contribution ID: 324

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

Measurement of hyperuniformity in pure amorphous silicon

Thursday 19 June 2014 09:15 (15 minutes)

Hyperuniform point patterns are characterized by a local variance that grows only as the surface area (rather than the volume) as the system gets larger and therefore do not possess infinite-wavelength fluctuations [F. Torquato & F.H. Stillinger, *Phys. Rev. E* **68**, 041113 (2003)]. Equivalently, it can be stated that for hyperuniform materials, the structure factor tends to zero for very small scattering vectors : $S(q \rightarrow 0) = 0$. It has been conjectured that pure amorphous silicon, a fully disordered and nearly-four fold coordinated solid, is nearly fully hyperuniform [M. Florescu *et al.*, *PNAS* **106**, 20658 (2009)]. However this suggestion has been contested, based on a large structure factor at small scattering vectors deduced from a computer model of amorphous silicon [A.M.R. de Graff & M.F. Thorpe, *Acta Crystallogr. A* **66**, 22–31 (2010)]. We have undertaken measurements of the structure factor of pure amorphous silicon, made by ion implantation, at the Argonne Advanced Photon Source. The experimentally determined structure factor is much smaller than the value deduced from the model, and thus we conclude that pure amorphous silicon is nearly hyperuniform [R. Xie *et al.*, *PNAS* **110**, 13250 (2013)].

Author: ROORDA, Sjoerd (Université de Montréal)

Presenter: ROORDA, Sjoerd (Université de Montréal)

Session Classification: (R1-3) Ion Beam Analysis and Modification - DCMMP / Analyse et modification de faisceaux d'ions - DPMCM

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