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Self Organization of Pb Islands on Si(111) Caused by Quantum Size Effects HAWOONG HONG, University of Illinois, Urbana-Champaign, LEO BASILE, Escuela Politécnica Nacional, PETER CZOSCHKE, Seagate Technology, AARON GRAY, TAI-CHANG CHIANG, University of Illinois, Urbana-Champaign — Growth of metallic Pb islands on Si(111) by vacuum deposition was studied in real time using synchrotron x-ray diffraction. The islands coarsen and order, maintaining a nearly uniform inter-island distance but without angular correlation. The resulting inter-island structure is akin to a two-dimensional liquid. Over a wide temperature range, the inter-island ordering is well correlated with the development of “magic” island heights caused by energy minimization of the Pb electrons. The results demonstrate quantum confinement effects as a driving force for self organization, as opposed to strain effects that generally govern the formation of semiconductor quantum dot arrays.

Hawoong Hong
University of Illinois, Urbana-Champaign

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