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Controlled self-organization of atom vacancies in pseudomorphic adsorbate layers: Ga/Si(112) E.J. MOON, University of Tennessee, Knoxville, USA, P.C. SNIJDERS, Kavli Institute of Nanoscience, Delft, The Netherlands, C. GONZÁLEZ, J. ORTEGA, F. FLORES, Universidad Autónoma, Madrid, Spain, H.H. WEITERING, University of Tennessee, Knoxville, and Oak Ridge National Laboratory — Ga adsorption on the Si(112) surface results in the formation of pseudomorphic Ga chains. Compressive strain in these atom chains is effectively released via the creation of adatom vacancies and their self-organization into almost evenly spaced vacancy lines (VLs). Here, we present a detailed study of these line defects using scanning tunneling microscopy, low energy electron diffraction, and density functional theory calculations. The average spacing between line defects can be varied continuously, within limits, by adjusting a single control parameter: the chemical potential of the Ga adatoms. The present study not only establishes the driving force and control parameter for self-organization, but also allows for precise determination of the relevant thermodynamic quantities, even for disordered nx1 sequences that cannot be evaluated directly with DFT.

E.J. Moon
University of Tennessee, Knoxville

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