Electrostatic potential screened by a two-dimensional electron system: A real-space observation by scanning tunneling spectroscopy
MASANORI ONO, YOSHIHIRO NISIGATA, TAKAHIRO NISHIO, TOYOAKI EGUCHI, The Institute for Solid State Physics, The University of Tokyo, YUKIO HASEGAWA, The Institute for Solid State Physics, The University of Tokyo; PRESTO, Japan Science and Technology Agency — Scanning tunneling spectroscopy at 5K was used to investigate the electrostatic potential profile on the Si(111)-\(\sqrt{3}\times\sqrt{3}\) Ag surface at sub-nanometer spatial resolution. The potential was measured from an energy-level shift of electronic states on the surface. The potential images obtained reveal that the potential drops around the steps and Ag adsorbates, upon which positive charges are presumably accumulated. The profiles of the reduced potentials are explained with the screening of potential due to the charges by two-dimensional electron gas (2DEG) existing on the surface. The Friedel oscillation, which results from the screening and has a period of the half Fermi wavelength of the 2DEG, was also observed in the potential images as well.

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Date submitted: 23 Nov 2005

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