

Step bunching kinetics of vicinal Si(111) near 7x7 transition temperature: x-ray scattering experiment

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Step bunching of vicinal Si(111) below the 7x7 to 1x1 reconstruction transition temperature has been well characterized by the argument of equilibrium crystal shape. Interestingly the step-bunched area and the (111) terrace exhibit self-organized hill and valley structure on the surface. The self-organized structure is driven kinetically and we can control the nano-scale structure by controlling kinetic variables near the transition temperature. We, therefore, investigated the step bunching kinetics of vicinal Si(111) by using synchrotron x ray to understand the nature of the bunching process.

Clean Si surface was kept above the transition temperature for 2 min, and then was quenched to the desired temperature below the transition temperature. Using real-time in-situ x-ray scattering technique, we measured the superlattice peaks that originates from the periodic structure of the step bunched surface as a function of time. The time evolution of the self-organized step-bunched structure will be discussed.