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Influence of impurities on phase transition in quasi-one-dimensional nanowires on Si surface GEUNSEOP LEE, WOOSANG LEE, HYUNGJOON SHIM, Inha University, Korea, SANG-YONG YU, JA-YONG KOO, Korea Research Institute of Standards and Science, Korea — We investigated using low-energy electron diffraction the influence of impurity doping on the structural phase transition in an array of quasi-one dimensional In nanowires on Si(111). A clean Si(111)4×1-In surface, in its pristine form, undergoes a structural phase transition into a 8×2 phase below 120 K. Introducing various impurities (hydrogen, oxygen, and alkali metals) on the surface at room temperature was found to affect the 4×1-to-8×2 structural phase transition by changing the transition temperature (T_c). Adsorption of the two types of the gases affected the transition in opposite ways: hydrogen adsorption lowered the T_c, whereas oxygen adsorption raised the T_c. Dosing of different alkali metals (Na, K, and Li) all decreased the T_c. Usually, impurities are expected to suppress the phase transition into the symmetry-broken phase (the low-temperature phase) by acting as random fluctuations in structure. In this sense, the increase in T_c by the oxygen adsorption is an exceptional case enhancing the phase transition. Possible mechanisms leading to different influences of the various impurities on the structural phase transition of this In/Si(111) will be discussed.

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