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Electronic band structures of K-adsorbed W(001) surface

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We have investigated the electronic and atomic structures of K-adsorbed W(001) surface above and below T_c using angle-resolved ultraviolet photoemission spectroscopy (ARUPS), low energy electron diffraction (LEED), and core-level shift measurement by synchrotron radiation. The surface bands as increasing coverage reveal several distinctive features, which are believed to be related to the overlayer metallization. According to the LEED study above and below Tc, the different atomic arrangements are observed near saturation coverage (~1ML). At initial coverage of K, the observed c(2x2) phase is originated from substrate W atoms arrangements with only charge transfer from K, while c(2x2) at higher coverage of K is due to overlayer K adatoms. Specially, below Tc, two c(2x2) phases can be distinguished by fuzzy hexagonal closed packed (HCP) phase, which implies that the local HCP structures are formed only at below Tc are reformed c(2x2) phase by dipole-dipole repulsions. Consequently, quasi 1-d metallic chain is observed only along Γ-M direction. From the surface band dispersions and corresponding LEED patterns in different substrate temperatures, we suggest possible two growth mechanisms of K on W(001) surface. These differences are believed due to the reconstruction of W(001) surface above and below T_c.