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In-situ microscopic investigations of the nucleation and growth of C₆₀ films on Bi(0001)/Si(111) JERZY T. SADOWSKI, T. NISHIHARA, A. AL-MAHBOOB, Y. FUJIKAWA, K. NAKAJIMA, T. SAKURAI, Institute for Materials Research, Tohoku University, Sendai, Japan, T. NAGAO, National Institute for Materials Science, Tsukuba, Japan — Growth of epitaxial C₆₀ films on Si is of particular interest for technological reasons. However, strong interaction between the C₆₀ molecules and the clean Si induces film growth in the Stransky-Krastanov mode with only local ordering in the first monolayer. Passivation of the Si dangling bonds – for example with hydrogen – leads to van der Waals bonding of adsorbates and thus higher degree of crystallinity in C₆₀ film, but the true relation between surface properties, and the crystallinity of the fullerene film is not yet fully understood. In this work, C₆₀ thin films were grown by UHV deposition on Si(111) substrate covered with thin Bi(0001) passivation layer. Real-time, dark-field low-energy electron microscope (LEEM) investigation of the growth revealed that C₆₀ film nucleates in fcc(111) phase, having an epitaxial relation with the Bi(0001) surface. At a growth temperature of ~400K, preferential nucleation of C₆₀ at Bi twin boundaries has been detected. Low-energy electron diffraction (LEED) confirmed that film had a single orientation and an excellent crystallinity. The in-plane lattice parameter in the C₆₀ films with thickness up to 3ML has been measured to be 10.04 ± 0.02 Å, which is very close to the bulk value of 10.01 Å.

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