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# Epitaxial Ag Film Growth on Si(100)

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Since Ag does not form silicides, the morphology variation of Ag film deposited on Si surfaces at 40K could be studied. The formed ultrathin films were in-situ analyzed by LEED, UPS and PAX under UHV in order to check their crystallinity, direction and work-function. Then, the film topography was checked by ex-situ AFM. Initially, the Ag film was thermally deposited onto the clean Si(100)-2x1 held at 40°K. The amorphous Ag film about 60Å fully covered the surface, and its work-function was 0.35eV lower than that of the crystalline Ag(111). Slow annealing it up to room temperature converts the amorphous Ag to crystalline Ag(111) film. The hexagonal LEED patterns of two 90°-off Ag(111) domains overlapped, and the Ag 4d bands started to show the dramatic angular dispersion. When Xe was exposed on this surface, the Xe preferentially adsorbed on Ag in the fashion of layer-by-layer. The first layer of Xe lowered the work-function of the adsorbed area by 0.56eV, which was checked by the second layer of adsorbed Xe. This Xe adsorption in layer-by-layer mode implicates that such slow annealing of Ag-film deposited at 40°K induces the large, flat and crystalline Ag island. This was also checked by ex-situ AFM analysis. On the other hand, the sizes and heights of Ag clusters, formed in the Xe buffer layer, were quite random compared to the previous Ag islands. Instead of slow warming up, the rapid annealing of amorphous Ag deposited at 40°K produced Ag islands of quite uniform size and the aligning of these uniform Ag islands formed by rapid annealing was affected by the substrate directions. On Si(111), such epitaxial growth could not be found, even though the Ag 4d bands showed angular dispersion. Such epitaxial Ag growth on Si(100) despite of 25% lattice mismatch was due to their weak s-p bonding between Ag and Si and their almost commensurate matching for two directions of Si(100) and Ag(111).

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