Island Formation at α- and β-Co/noble-metal Interface

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¿From various factors accompanying the growth of ultrathin films of α- and β-Co on Au(111) we investigate island formation using first-principle density-functional calculations. Both the empirical data and the numerical calculations indicate that Co thin films, deposited on Au(111), display a tendency to roughening at the interface. The roughening can be both spontaneous and/or stimulated by adequate geometry of the substrate (for instance, stepped wedge structure). As a result, there is observed a significant change of magnetic anisotropy. The main objective of the paper is to estimate the relation between tendency towards the spontaneous island formation and the number of Co monolayers. For a relatively small number of the monolayers (up to 6), deposited on Au, island formation is energetically preferred over the formation of homogeneous atomic films. However, this relation is not straightforward. In general, once a compact Co monolayer is formed, the tendency towards surface roughening is largely suppressed. A similar effect is observed in films capped with Au and Ag. The numerical calculations enable us to identify the driving force responsible for the result.

9.7 cm

13.4 cm

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