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Nucleation and growth of Co on Ge(001)

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We observed nucleation behaviors of Co/Ge(001) system with increasing the temperature from 300 K to 630 K. At 300 K, Co atoms adsorb on Ge dimer row. Two bright protrusions appear on top of a dimer row (bridge site) in sequence and the dimer vacancy sandwiches them (feature A). By annealing the sample at 600 K, feature A is likely to be ordered perpendicular to the Ge dimer row direction. And the new feature B appears in the trough position (cave site). This observation is the site conversion[1,2] between the bridge site and cave site by thermal annealing. Finally, feature B is converted into the feature C, which is shown like a hexagon in the empty state STM image. After further annealing at 630 K, feature A and B disappear. Finally, feature C becomes dominant.

Furthermore, we monitored the growth behaviors of this system with increasing the coverage of Co at 630 K. At low coverage, dimer, trimer etc. of feature C makes a one-dimensional chain. But they do not grow longer. At higher coverages, anisotropic two-dimensional islands begin to grow. Finally, with the disappearance of feature A and B, three-dimensional Co_5Ge_7[3,4] islands are formed.

[References]

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