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Magicity of Ag nanoclusters on Si(111)-(7×7) by atomic manipulation FANGFEI MING, The Chinese University of Hong Kong, GUOHUA ZHONG, Shenzhen Institute of Advanced Technology, Chinese Academy of Science, Shenzhen, KEDONG WANG, The Chinese University of Hong Kong, ZHENYU ZHANG, ICQD, Hefei National Laboratory for Physical Sciences at Microscales, University of Science and Technology of China, XUDONG XIAO, The Chinese University of Hong Kong and Shenzhen Institute of Advanced Technology, Chinese Academy of Science, Shenzhen — Nanoclusters with extra stability at certain cluster sizes are known as magic clusters, whose magicity depends sensitively on the environments. Using scanning tunneling microscopy and first-principles calculations, we explore the dynamics and magicity of Agn (n=1-26) clusters constructed atom-by-atom on a Si(111)-(7×7) surface. By measuring the thermal stability of clusters of increasing size, a set of magic clusters are distinctly established, which in return helps to reveal the preferred growth sequence towards geometrically close-shelled Ag10 and Ag25 clusters with extra inertness. We further use a probing atom to demonstrate that the adatom-cluster interaction is highly anisotropic, preserving the attractive nature of an Ag-Ag bond at short distances, but becoming repulsive at large distances mediated by the substrate. These innovative findings of fundamental importance are also expected to be significant in surface catalytic reactions and related technological areas.

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