

Modeling the Growth of Nanostructures on Nanostructures

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Growth of ordered semiconductor epitaxial nanostructures on low-dimensional nanostructures, such as nanowires and nanoparticles, has attracted great attention. How to control the growth process so as to achieve stable, ordered nanostructures is still a challenge. In this talk, we report our recent theoretical and modeling studies on the growth of nanostructures, such as nanorings and nanodots on cylindrical and polygonal nanowires and spherical and polygonal nanoparticles. Our results reveal that, for the epitaxial growth on cylindrical nanowires and spherical nanoparticles, self-assembly does not lead to stable and ordered nanostructures. However, for the growth on polygonal nanowires and nanoparticles, self-assembly can lead to stable, ordered formation of epitaxial nanostructures. The finite feature sizes of polygonal nanowires or nanoparticles serve as a controlling parameter to achieve different ordered nanostructures. The predicted morphologies and their transitions are in excellent agreement with existing experiments. Our studies suggest a novel approach to fabricate novel nanostructures on nanostructures.