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Self-organization and geometry control of Pb islands grown on anisotropic substrates MYRON HUPALO, MICHAEL TRINGIDES, Iowa State University, Ames Laboratory of US DOE, Ames, IA 50011 — The growth of uniform nanostructures requires discovering robust and reproducible ways to control their size and geometry. It is found that the growth of Pb on the anisotropic substrate In(4x1)-Si(111) leads to full control of the grown morphology from the interplay of two stabilizing mechanisms which minimize the island energy at preferred geometry. Quantum Size Effects (QSE) i.e. the dependence of the electron energy on the structure dimensions as a result of electron confinement result in uniform height 4-layer Pb islands grown at 180K. More importantly the island shape and width are controllable, with the width an integer multiple of 1.33nm (the period of the initial In(4x1)along $[\bar{1}\,\bar{1}\,2]$), because the underlying reconstruction generates anisotropic potential energy relief with preferential sticking of the incoming Pb atoms along $[\bar{1}\,10]$. Growth on the different reconstructed substrate, Si(111)-In$\sqrt{31}$x$\sqrt{31}$, leads to uniform height Pb islands of hexagonal shapes thus demonstrating island shape control.

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