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Unusual Dramatic Surface Restructuring of Silicon Substrate during Epitaxy TANYA GUPTA, DANIEL STEINGART, Princeton University, JAMES HANNON, IBM, PRINCETON UNIVERSITY COLLABORATION, IBM COLLABORATION — Interfacial strain is unavoidable in heteroepitaxial growth and can have a profound impact on the morphology and properties of thin films. In fact, "engineering" thin-film strain is a critical component in many advanced technologies. For example, straining the silicon in advanced CMOS devices can increase the device speed by as much as 90 percent.order to control interfacial strain, its effects on growth must be understood. The common picture is that the growth substrate is essentially passive: its role is to provide the lattice mismatch that the growing film must respond to. As the film grows thicker, the stress in the film evolves, which can lead to morphological changes in the film, e.g. dislocations, or a change in growth mode from 2D, planar growth to 3D, quantum dot growth., in both of these examples, the action is in the growing film. In this work we describe a growth system that behaves in a completely unexpected manner that does not fit into this conventional picture. Interfacial strain that accompanies the growth of SiC nanoparticles is relieved by a dramatic restructuring of the *substrate* rather than the nanoparticles. The growth of nanoparticles induces a massive change in the substrate. In situ measurements of the Si mound formation was done with the use of LEEM. Using a simple, illustrative model with parameters taken from the literature, we show that the shapes and heights of the mounds are consistent with a strain-driven formation mechanism.

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