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Tensile-strained self-assembled III-V nanostructures PAUL SIMMONDS, MINJOO LARRY LEE, Yale University — We present, for the first time, growth of self-assembled nanostructures via a novel combination of tensile-strained GaP on (110) GaAs. Several material systems exhibit self-assembling behavior driven by strain relief. To date, much of the work on quantum dots formed by such processes has focused on situations combining (001) surfaces with compressive strain; notably Stranski-Krastanov growth-mode InAs/GaAs and Ge/Si. Attempts to grow similar dots on other low-index planes often results in heavily dislocated 2D films. We demonstrate that 3D GaP nanostructures form spontaneously on (110) GaAs, even at submonolayer thickness, implying a Volmer-Weber growth-mode. These features exhibit high shape and size uniformity, with smaller dots showing no evidence of dislocations in cross-sectional TEM. Tuning of MBE parameters enables control of dot densities from 10^6 - 10^8 cm^{-2}. Since formation occurs solely at terrace edges, further engineering of dot coverage may be possible using off-cut (110) substrates to vary step-edge density. It is anticipated that this work will form the first step towards a more general description of self-assembled nanostructure growth under tensile strain.

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