Semiconductor quantum dots have optoelectronic properties that attract and justify the efforts of many research teams around the world. However, the production of high efficiency optoelectronic devices depends on a fine control of the morphology, density, size, shape, uniformity and chemical composition of these nanostructures. Several techniques to induce a localized growth of QDs can be combined with modern growth techniques in an attempt to control the precursor’s nucleation on the substrate surface. One of techniques employed in this process is the Focused Ion Beam Microscopy (FIB) [1,2]. In this technique a gallium ion beam is used to create localized surface defects that become nucleation sites for the localized growth of quantum dots. In this work we used this technique to create an array of holes on InP(001) surface to serve as diffusion barrier increasing the nucleation rate located during InAs grown by Metal Organic Vapor Epitaxy. The doses used were 3.7x10^{15}, 5.6x10^{15} and 1.3x10^{16} Ga/cm². Islands were grown for two sub-monolayer coverages, occurring mostly in clusters in the inner surfaces of the FIB produced cavities. For low doses templates the nanostructures are mainly coherent. For high doses the islands are mostly incoherent and numerous. A simple model correlating the surface potential of the template with the net adatom flow to the cavities is presented. Two regimes were identified, coarsening and coalescence when low doses were applied, and incoherent growth when high doses were used.

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Fig. 1: Figure (a) shows a schematic diagram of the adatoms diffusion process into the cavities and islands growth. (b) Analysis of islands density on an InP modified substrate as a function of ion dose, indicating the presence of two distinct growth regimes.