Surface alloys can be formed either by deposition or by dissolution of a thin film on a metallic substrate. Generally due to the confinement in the surface region, one observes alloys with unusual atomic structures and chemical compositions. One category of systems appears particularly interesting from the point of view of electronics properties: semiconductor-on-metal systems. Indeed, due to the strong difference of the pure elements i.e. atomic structure and electronic structure (metallic bonds versus covalent bonds), one can expect a strong effect of both strain and confinement. This is especially true for non-reactive metal-semiconductor systems, i.e. systems which present a strong trend toward phase separation.

In this presentation we will give an overview of the different behaviours observed during the deposition and/or the annealing of ultra-thin films of semiconductors (Ge and Si) on different metallic substrates. We will show in particular that for non-reactive metal-semiconductor systems, the tendency for semiconductors to form strong lateral covalent bounds can generate unexpected nanostructures.