

## First evidence of quantum well states at the Ag/ $\beta$ -Si<sub>3</sub>N<sub>4</sub>(0001)/Si(111) interface

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Interface states induced by metal silicides (MIGS) degrade the electronic properties of a metal/silicon interface. Nowadays, as the realization of applications linked to spintronics have become likely to occur soon, higher standards are desired for an ideal metal/silicon interface, to match the electronic industry needs. Usually, the interfaces of electronic devices are not abrupt, the buffer layer being always amorphous and source of defects [1]. As an exception, it is known that epitaxial Si<sub>3</sub>N<sub>4</sub>(0001) films can be formed by thermal nitridation of Si(111) substrates at high temperature, the 2x2 cell of the Si(111) surface being only 1.2% larger than the unit cell of the  $\beta$ -phase of the Si<sub>3</sub>N<sub>4</sub>(0001) [2]. A peculiarity of this system is that thermal nitridation of Si(111) always produces ultrathin and crystalline films (about 1 nm thick), as the nitridation process is self-limited. As a consequence, the  $\beta$ -Si<sub>3</sub>N<sub>4</sub>(0001) acts as an ultrathin passivation layer, suppressing the metal-Si reaction [3-5].

Metal adsorbates (Co, Au, Fe for instance) generally follow a Volmer-Weber growth mode [3-5]. However, for an ideal metal/silicon interface with no gap states to be used in electronic devices, a layer-by-layer growth mode is required. This is why we employed another strategy based on the well-known two-step growth: in the first step the sample is kept at the liquid nitrogen temperature during growth and, in the second step, the sample is left recovering room temperature. Preliminary angle resolved photoelectron spectroscopy (ARPES) measurements performed at the VUV beamline (Elettra Trieste) show the presence of quantum well states, signature of the silver epitaxial growth.

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