Fermi Gap Engineering by Au doping of the Ag/Cu(111) Dislocation Network

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Self-assembled metallic superlattices have attracted much attention in the context of nanoscale fabrication, due to their suitability for nanostructured templates with 1-10 nm periodicities. Ag/Cu(111) represents one of the most simple and promising metallic superlattices. The fact that this system features a surface state with a gap at the Fermi energy[1] makes it a suitable candidate for surface state nanoelectronics materials[2]. In this context, we present an Angle Resolved Photoemission Spectroscopy study of Au-doped 1ML and 2ML Ag/Cu(111) systems. The $\overline{M}$ -point Fermi gap of 1ML Ag/Cu(111) system has been found to move smoothly below the Fermi level as a function of Au doping. The 2ML Ag/Cu (111) system does not reveal a gap below the Fermi level, but such gap arises with Au doping. Such control over the Fermi gap in 1ML and 2ML Ag/Cu(111) might open a new way for further application in the very same analogue to the graphene-based technology.

References:

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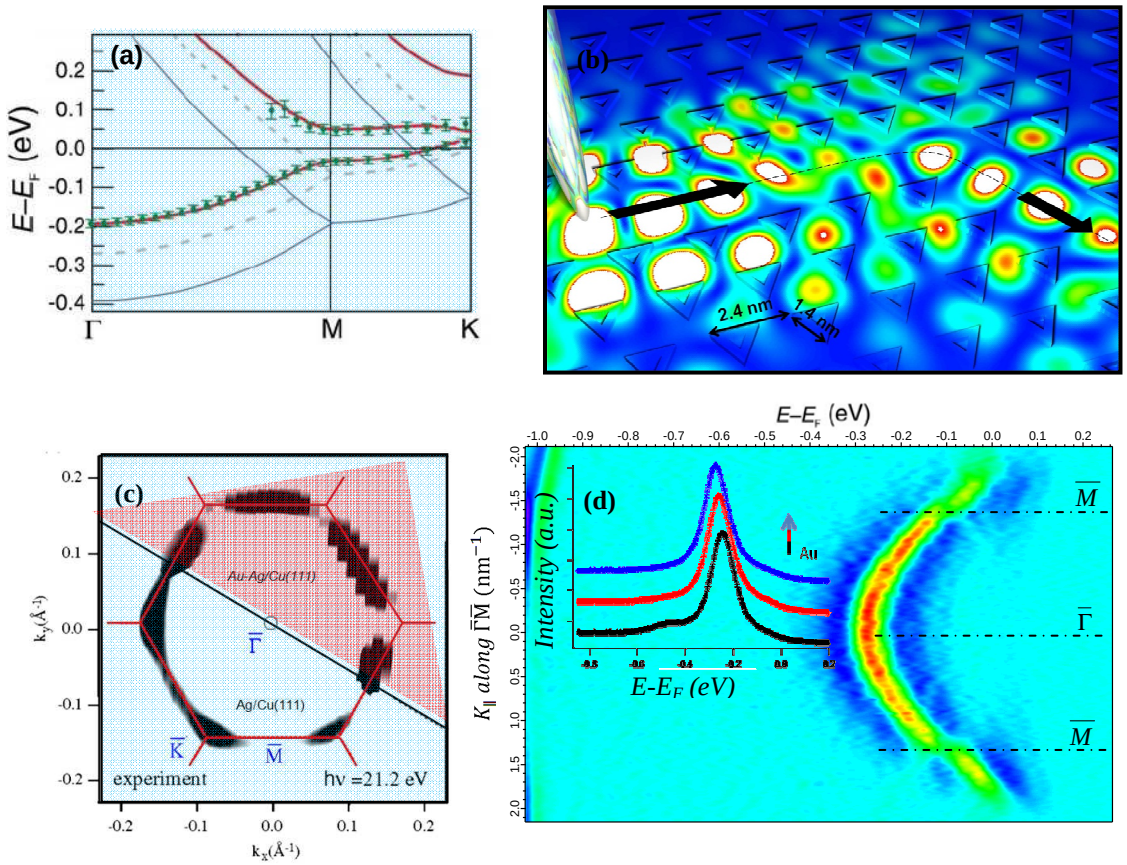

Figure: (a) Surface bands for Cu(111) (blue), a simple model band structure calculation of the 1ML Ag without triangular dislocations (dotted), with triangles (red), and experimetal photoemission data (symbols) for the trianglular network [2]. **(b)** Principle of waveguiding and bending of electronic surface states (EESs)[2]. **(c)** Fermi surface of 1ML Ag/Cu(111) and Au doped Ag/Cu(111). **(d)** Surface state of 1ML Ag/Cu(111) doped with certain amount of Au and the corresponding energy distribution curves as a function of Au doping.