

Epitaxial Thin Films on Tsai-type Quasicrystals

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We will present several interesting structures of thin films grown on Tsai-type quasicrystal, icosahedral (*i*)-Ag-In-Yb, studied by various experimental techniques including scanning tunnelling microscopy (STM). The results include three dimensional quasicrystalline films of single elements [1] and molecular films [2] (Figure 1).

The *i*-Ag-In-Yb quasicrystal is built by rhombic triacontahedral (RTH) clusters and its surface is formed at the bulk atomic planes that bisect the RTH clusters [3]. When Pb is deposited on the fivefold *i*-Ag-In-Yb surface, the Pb atoms adsorb at the sites that were originally occupied by the cluster atoms and thus produce quasicrystalline film in three-dimension [1]. This observation is evidenced in other systems as well, namely Pb on the threefold and twofold *i*-Ag-In-Yb surfaces [4, 5] and In, Sb and Bi on the fivefold *i*-Ag-In-Yb surface [6].

We also found that Pentacene molecules deposited on the fivefold *i*-Ag-In-Yb surface adsorb at tenfold-symmetric sites of Yb atoms around surface-bisected RTH clusters, yielding quasicrystalline order [2]. The selective adsorption of Pentacene on Yb sites is also observed on the threefold and twofold surfaces of the same sample.

The phenomena of adsorption on selective sites is also found on Al-based quasicrystals. C₆₀ molecules preferably adsorb on Fe or Mn when deposited on surfaces of *i*-Al-Pd-Mn and *i*-Al-Cu-Fe [2, 7], yielding quasicrystalline order of C₆₀. The compatibility between the characteristic lengths of the substrate and the size of adsorbates has led to the growth of unprecedented epitaxial structures.

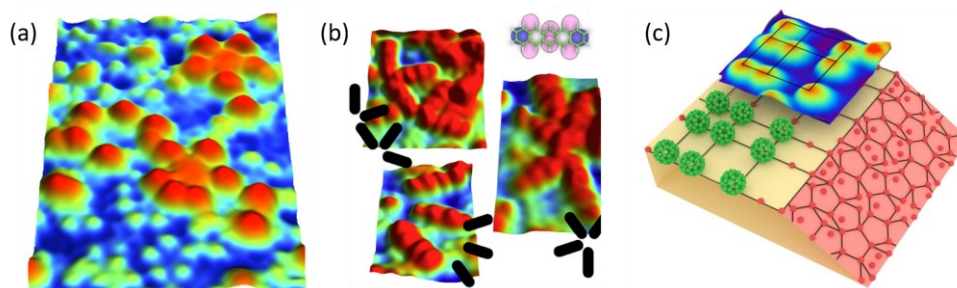


Figure 1. (a) Pb on the fivefold *i*-Ag-In-Yb surface [1], (b) Pentacene on the fivefold *i*-Ag-In-Yb surface [2], and (c) C₆₀ on the twofold *i*-Ag-In-Yb [7].

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