NANO-EPITAXY ON QUASICRYSTAL SURFACES

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The hetero-epitaxial growth of dissimilar materials is normally expected to reveal a wealth of interesting phenomena. The equilibrium structure of the growing film in such systems is enforced by the relative strengths of various competing interactions which occasionally results in a new and unusual epitaxy-stabilized structure. An extreme example to such a system is the growth of a periodic, crystalline material on an aperiodic, quasicrystalline substrate. We have deposited Al atoms on the decagonal surface of the quasicrystal Al-Ni-Co. The surface structures are investigated using low-energy electron diffraction and secondary-electron imaging experiments. We have observed that well-oriented nanometric Al single crystals grow, satisfying the epitaxial conditions on a local scale. Ten different crystallites are aligned in equal azimuthal distribution, reflecting the rotational order of the substrate. Further, on the pentagonal surface of the icosahedral Al-Pd-Mn, the growth morphology is temperature dependent, owing to the importance of surface diffusion.