A molecular overlayer with the Fibonacci square grid structure

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Quasicrystals are frequently associated with orders of rotational symmetry which are forbidden in periodic crystals. However, previous theoretical work has explored the structure and properties of a hypothetical four-fold symmetric quasicrystal—the so-called Fibonacci square grid [1]. Here, we show an experimental realisation of the Fibonacci square grid structure in a molecular overlayer. Scanning tunnelling microscopy reveals that fullerenes (C60) deposited on the two-fold surface of an icosahedral Al–Pd–Mn quasicrystal selectively adsorb atop Mn atoms, forming a Fibonacci square grid. The site-specific adsorption behaviour offers the potential to generate relatively simple quasicrystalline overlayer structures with tunable physical properties and demonstrates the use of molecules as a surface chemical probe to identify atomic species on similar metallic alloy surfaces.

[1] Lifshitz, Ron. Journal of alloys and compounds 342.1-2 (2002): 186-190.

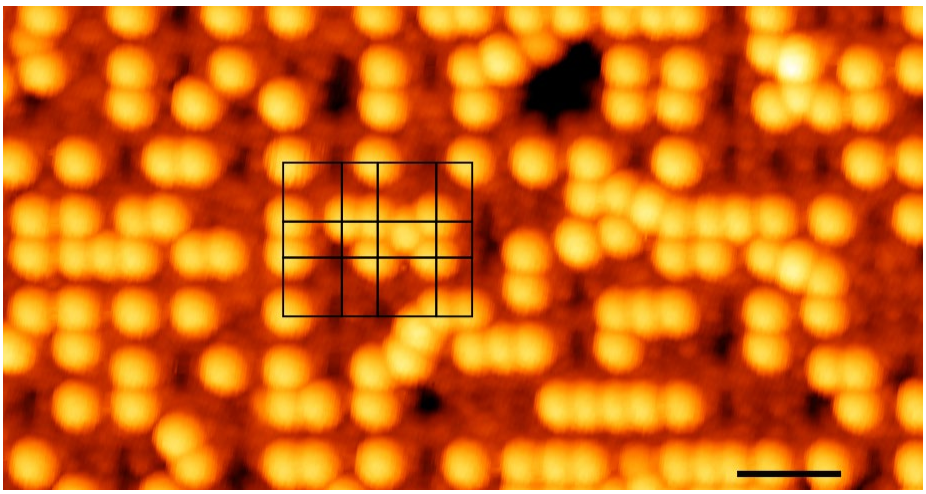

Fig.1: STM image of C_{60} on the two-fold surface of Al–Pd–Mn. A section of the Fibonacci grid connects individual molecules. Scale bar is 4 nm.