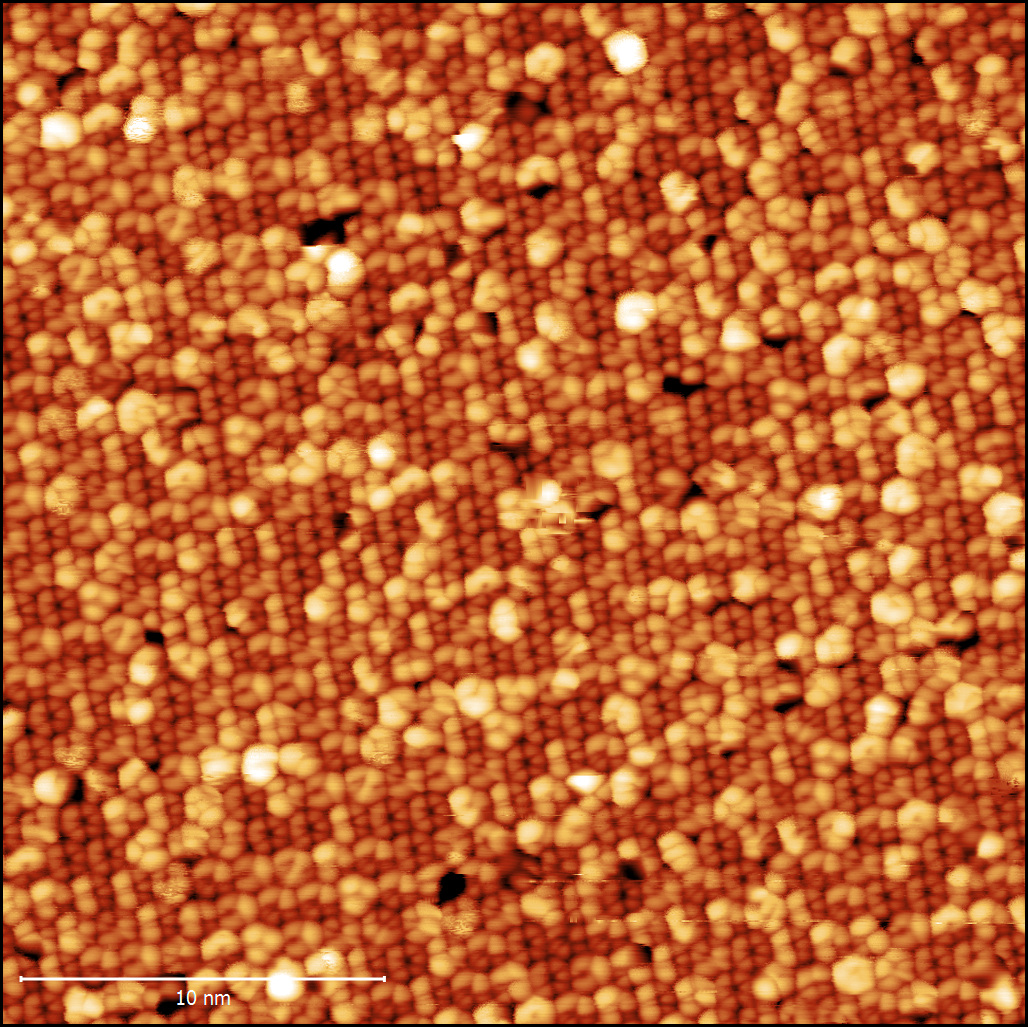
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Polycyclic Aromatic Hydrocarbons as Catalysts for Chemical Complexity in Space.

Interstellar space harbours a surprising chemical complexity in spite of the extremely low temperatures and pressures that characterize it. This chemical complexity is thought to be catalyzed by interstellar nanoscale dust grains and large carbonaceous molecules such as the Polycyclic aromatic hydrocarbons (PAHs). PAHs are ubiquitous in interstellar space, however, their impact on interstellar chemistry is still not thoroughly understood. Theoretical calculations and experimental measurements show that PAHs react readily with atomic hydrogen to form superhydrogenated species - e.g. PAH molecules like pentacene and coronene can be fully superhydrogenated with one excess H atom pr. carbon atom via H atom addition. Once super-hydrogenated, PAH molecules can act as catalysts for molecular hydrogen formation and may participate in further reactions towards formation of a variety of hydrocarbon molecules. In the talk I will present Scanning Tunneling Microscopy and temperature programmed desorption measurements of hydrogen and deuterium addition reactions on a selection of PAHs molecules with focus on resulting stable superhydrogenation configurations and cross-sections and isotope effects for the initial H and D addition reactions. Density Functional Theory calculations provide insights into the underlying principles that guide the hydrogen functionalization pathways. Furthermore, I discuss reactions towards more complex species via hydrogenation of pentacene-quinone and fragmentation of functionalized PAHs.



STM image of superhydrogenated Ccoronene molecules on a graphite surface.