Size-Selective Carbon Nanoclusters as Precursors to the Growth of Epitaxial Graphene

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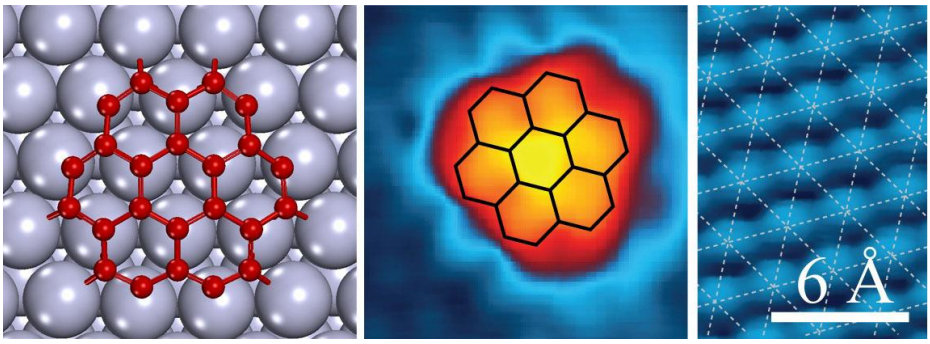
The nucleation and growth mechanisms of epitaxial graphene on a Rh(111) surface will be presented [1]. STM and DFT calculations show that carbon nano-islands form in the initial stages of graphene growth using ethylene as the carbon source, possessing an exclusive size of 7 honeycomb carbon units (hereafter labeled as $7C_6$). These magic-sized clusters adopt a dome-like hexagonal shape indicating that bonding to the substrate is localized on the peripheral C atoms. Smoluchowski ripening is identified as the dominant mechanism leading to the formation of graphene, with the size-selective carbon islands as precursors. Control experiments and calculations, whereby coronene molecules, the hydrogenated analogues of $7C_6$, are deposited on Rh(111), provide an unambiguous structural and chemical identification of the $7C_6$ building blocks.

References

[1] B. Wang, X.-F. Ma, M. Caffio, R. Schaub, W.-X. Li, Nano Letters, **11** (2011) 424.

Figures



Ball-and-stick model (left) and high resolution STM image (right) of the size-selective $7C_6$ nanoclusters identified as precursors to the growth of graphene on a Rh(111) surface.