Experimental Realization of a 2D Oxygen Crystal on Cu(111)

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Two-dimensional (2D) materials have emerged as essential platforms for investigating novel physical phenomena and developing groundbreaking applications, driven by their reduced dimensionality and unique properties. Here, we report the formation of a highly ordered 2D oxygen crystal, termed "oxylene," achieved by utilizing the exceptional oxidation resistance of an ultraflat Cu(111) substrate and low-temperature exposure to oxygen gas. Scanning tunneling microscopy (STM) reveals that oxylene adopts a honeycomb structure with oxygen atom clusters occupying both face-centered cubic (fcc) and hexagonal close-packed (hcp) sites in a 4×4 periodic arrangement. Spin-sensitive STM measurements further indicate a distinct magnetic ordering within the oxylene layer. If time allows, I would also like to briefly introduce our recent STM studies on ternary transition metal dichalcogenide (TMD) systems.