

ON-SURFACE SYNTHESIS: A BOTTOM-UP STRATEGY TO LOW-DIMENSIONAL CARBON-STRUCTURES

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On-surface synthesis via covalent coupling of adsorbed molecules on metal surfaces has attracted significant attention in recent years due to its potential to fabricate low-dimensional carbon materials with atomic precision. The bottom-up, atomically precise synthesis of carbon nanostructures enables the tailoring of their electronic properties at a molecular level. To understand and control the surface-chemistry-driven synthesis, many efforts have been made to design smart precursors, explore novel reaction schemes, and utilize templating effects from the substrate. Scanning probe microscopy has become an essential tool for studying on-surface reactions and molecular structures.

My presentation focuses on high-resolution scanning probe microscopy experiments combined with density functional theory to demonstrate recent highlights on the assembly of surface-supported low-dimensional carbon structures. In particular, the assembly and electronic structure of planar π -extended cycloparaphenylene macrocycles, which represent the first nanographene with an all-armchair edge topology, will be discussed [1]. [n]cycloparaphenylenes ([n]CPPs) have attracted significant attention due to their unique cyclic structure and highly effective para-conjugation leading to a myriad of fascinating (opto-)electronic properties. However, their strained topology prevents the π -extension of CPPs from converting them into armchair nanobelts or planarized CPP macrocycles. We have successfully tackled this long-standing challenge and present the bottom-up synthesis and characterization of atomically precise in-plane π -extended [12]CPP on Au(111).

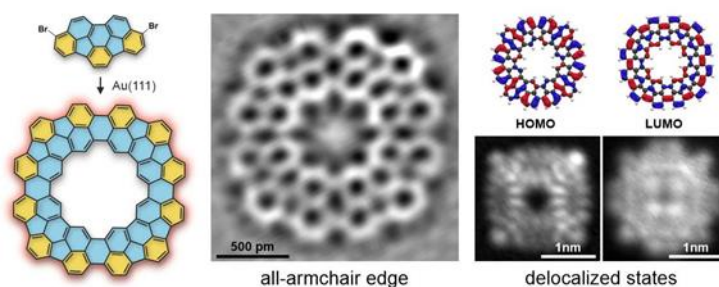


Figure 1. Planar π -extended cycloparaphenylene synthesized by on-surface synthesis and characterized by scanning probe microscopy techniques.[1]

References

[1] F. Xiang, et al. Nature Chem., 2022 14, 871–876.