
Researchers Add New Member to Carbon Material Family, A Two-Dimensional Monolayer Polymeric Fullerene

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Researchers have developed a new interlayer bonding cleavage strategy to prepare a two-dimensional monolayer polymeric fullerene.

Synthetic carbon allotropes are fascinating for their outstanding properties and potential applications. Scientists have devoted decades to synthesizing new types of carbon materials. However, a two-dimensional fullerene, which possesses unique structure, has not been successfully synthesized until now.

Recently, a research group led by Prof. ZHENG Jian from the Institute of Chemistry of the [Chinese Academy of Sciences](#) (ICCAS) developed a new interlayer bonding cleavage strategy to prepare a two-dimensional monolayer polymeric fullerene.



The structure of monolayer polymeric C60.

The researchers prepared magnesium intercalated C60 bulk crystals as the precursor to the exfoliation reaction. They then utilized a ligand-assisted cation exchange strategy to cleave the interlayer bonds into bulk crystals, which led to the bulk crystals being exfoliated into monolayer nanosheets.

The structure of monolayer polymeric C60 was explored by single crystal X-ray diffraction and scanning transmission electron microscopy (STEM). In this monolayer polymeric C60, cluster cages of C60 are covalently bonded with each other in a plane, forming a regular topology that is distinct from that of conventional 2D materials.

Furthermore, the monolayer polymeric C60 exhibits an interesting in-plane anisotropic property and a moderate bandgap of 1.6 eV, which makes it a potential candidate for use in electronic devices.

"The work is the first to synthesize a monolayer polymeric fullerene. It is of great significance, as it adds a new member to the carbon material family," ZHENG said. "This work has opened up a new research field in two-dimensional carbon material areas and the synthesis strategy could provide a unique perspective in exploring new carbon material."

The study, entitled "Synthesis of a monolayer fullerene network" was published in [Nature](#).

Read the [original article](#) on Chinese Academy of Sciences (CAS).