Chemical coordination induced fullerene dimers on hot Pt(111)

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Fullerenes exhibit remarkable properties that enable the formation of lubricated nano-onions and fragmentation into carbon clusters under various conditions. We investigate the thermal behavior of C_{60} islands on Pt(111) surfaces, examining island segregation, fullerene dimer formation, and subsequent graphene sheet development. Through non-contact atomic force microscopy and scanning tunneling microscopy, we demonstrate that C_{60} islands remain largely unchanged after annealing at 500 K compared to room temperature deposition. At 800 K, isolated C_{60} dimer pairs emerge with limited surface mobility, presenting potential pathways for graphene quantum dot (GQD) formation. Controlled annealing at 900 K further optimizes the quality and dimensions of resulting graphene patches. This thermal processing approach offers a promising route for high-quality graphene synthesis while maintaining isolated C_{60} dimers on Pt(111), with implications for advanced materials synthesis and tribological applications.

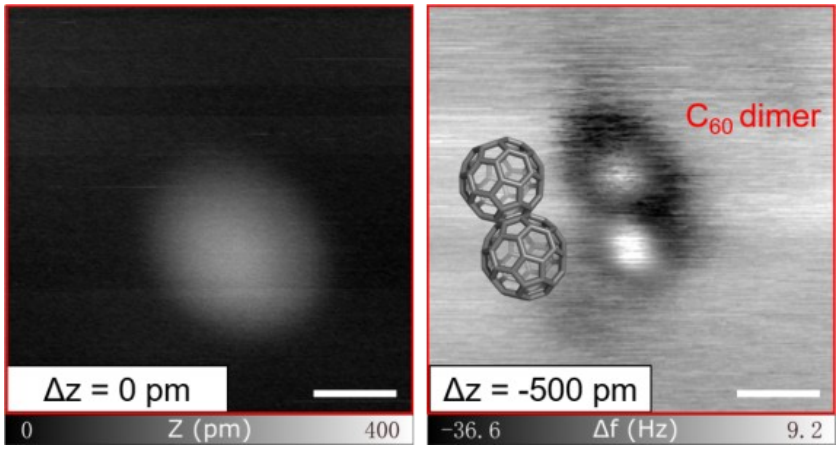

Figure 1. nc-AFM topography (left) and normal frequency shift (Δf) of the second-pass scan of the same C_{60} dimer at a lower tip height Δz = -500 pm.

Reference

[1] Z. Liu et al., Angew. Chem., Int. Ed., https://doi.org/10.1002/anie.202505101, (2025).