Fullerene Nanoarchitectonics: From Zero to Higher Dimensions

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Fullerene (C_{60}) molecule and their self-assembled nanostructures have received considerable attention in the past two decades due to their important potential applications in diverse fields including materials engineering, physics, chemistry, and optoelectronics. In order to construct advanced electronic, photonic, or bionic devices, this functional molecule requires assembly into well-defined forms (1D, 2D or 3D). In this contribution, we discuss our recent results in the production of crystalline C_{60} with diverse morphologies at liquid-liquid interface. Fullerene nanostructures such as nanorods, nanotubes, nanosheets, and nanocubes could be grown at liquid-liquid interface under ambient conditions. Solubility of C_{60}, solvent molecular architecture, diffusion dynamics of C_{60} molecules from the bulk to the interface and temperature played important role to regulate the size and shape of the fullerene nanostructures. The C_{60} molecule can be regarded as an ideal zero dimensional building blocks with striking functions. Therefore, construction of higher-dimensional objects, such as 1D, 2D or 3D nanomaterials may realize important aspects of nanoarchitectonics. We also discuss novel techniques for the expansion of fullerene nanomaterials into hierarchic structures such as bimodal macro and mesopores architecture.

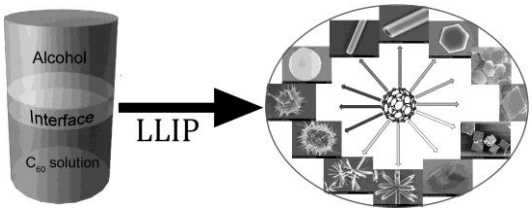

Fig. 1 Zero to higher dimensional C_{60} nanoarchitectures at liquid-liquid interface.