Perfluorocycloparaphenylenes: Fully fluorinated carbon nanorings by Ni-mediated one-pot synthesis

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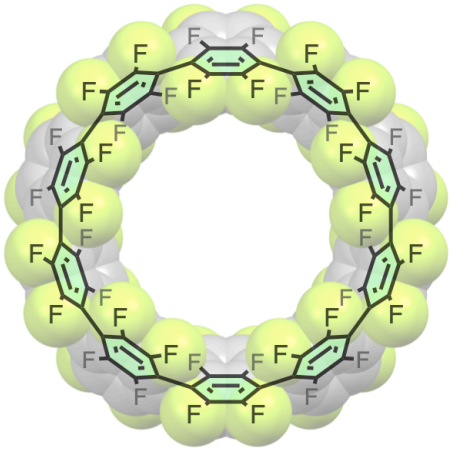
Perfluorinated aromatic compounds, the so-called *perfluoroarenes*, are widely used in materials science owing to their high electron affinity and characteristic intermolecular interactions. However, methods to synthesize highly strained perfluoroarenes have remained elusive so far,[1] which greatly limits their structural diversity. Herein, we report the synthesis and isolation of perfluorocycloparaphenylenes (PFCPPs) as a class of ring-shaped perfluoroarenes.[2] Using macrocyclic nickel complexes, we succeeded in synthesizing PF[*n*]CPPs (*n* = 10, 12, 14, 16) in one-pot without noble metals. The molecular structures of PF[*n*]CPPs (*n* = 10, 12, 14) were determined by X-ray crystallography to confirm their tubular alignment. Photophysical and electrochemical measurements revealed that PF[*n*]CPPs (*n* = 10, 12, 14) exhibit wide HOMO–LUMO gaps, high electron affinity, and strong phosphorescence at low temperature. PFCPPs are not only useful as electron-accepting organic semiconductors but can also be used for accelerating the creation of topologically unique molecular nanocarbon materials.



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