Electrochemically-Induced Reactivity of Fullerene Derivatives

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Since the debut of C60 on a macroscopic scale, electrochemistry has played an important role in its characterization and, later on, with the blossoming of the rich chemistry of fullerenes, it has represented one of the crucial techniques for the investigation of fullerene-based materials. At the same time, it was soon found that important structural modifications could be induced in various classes of fullerene derivatives by the injection of one or more electrons. Electrochemically-induced reactions that may be found in the chemistry of fullerenes comprise, for instance, valence-bond isomerization in methanofullerenes, rearrangement of addends in multiple cycloaddition adducts, carbon-halogen bond cleavage followed by aromatization of the fullerene residue, migration of addends, and also reactions of preparative importance such as the removal of malonate addends promoted by bulk electrolysis. Fullerene derivatives have often been used in molecular and supramolecular architectures because of their unique electron accepting properties; they are, for instance, ideal partners of suitable electron donors in photoactive molecular devices. Mechanistic studies addressing issues such as the reactivity (or stability) of reduced fullerenes are therefore instrumental in the design of novel functional materials based on such species.