

Synthesis of Multi-oxygenated Fullerene Derivatives

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Multi-oxygenated fullerene derivatives such as fullerenols and fullerene epoxides have attracted much attention due to their potential applications as pharmaceuticals and in materials science. A number of methods have been reported for their preparation. Most of the known reactions give complex multi-adducts with poor selectivity. Here we report our effort in the synthesis of isomerically pure multi-oxygenated fullerene derivatives such as fullerene mixed peroxides and fullerene epoxides.

Various reagents and conditions have been examined to improve the selectivity of the oxygenation reaction of fullerenes. Oxygen centered radical addition appears quite efficient. For example, *t*-butylperoxy radicals generated by TBHP and Ru(PPh₃)₃Cl₂ or other catalysts add to C₆₀ and C₇₀ to form stable multiadducts, C₆₀(O)(OO^tBu)₄ and C₇₀(OO^tBu)₁₀. The compounds are fully characterized by spectroscopic data. Further transformation of these fullerene mixed peroxides into fullerenols and fullerene epoxides will be discussed. Other strategies for the selective synthesis of multi-oxygenated fullerene derivatives will also be presented.