Synopsis of Original Research Paper

Design and Antioxidative Effects of Water Soluble Fullerenes

Tsuyoshi Michinobu

Department of Materials Science and Engineering, Tokyo Institute of Technology Tsuyoshi Michinobu

The radical scavenging properties of fullerene (C_{60}) have attracted much attention with a view to commercialization. However, a hydrophobic feature of C_{60} made it difficult to homogeneously distribute in an aqueous solution. In order to increase the water solubility, chemical modification was often adopted. Alkyne-appended C_{60} derivative was synthesized by a Bingel method. The alkyne moiety of this C_{60} derivative was further functionalized by the Cu(I)-catalyzed azide-alkyne cycloaddition (CuAAC) reaction. Azide-substituted poly(ethylene glycol) (PEG) was attached to the C_{60} derivative by CuAAC, yielding PEGylated C_{60}. Although sufficiently long PEG with the molecular weight of 5000 was employed, the PEGylated C_{60} was not soluble in water but soluble in methanol. The high solubility in methanol allowed for the evaluation of radical scavenging properties. When a solution of PEGylated C_{60} in methanol was added to a mixed aqueous solution of β-carotene and linoleic acid, the peroxide attack to β-carotene was clearly suppressed. This was due to the radical scavenging property of the C_{60} derivative. This suppression effect became stronger when the concentration of PEGylated C_{60} increased. This result again supports the radical scavenging property of PEGylated C60 derivative and poses the potential use as an antioxidant.