

## Study of Nano-scale Fullerene (C60) Clusters Formed in Micro-sized Droplet by UV Irradiation

Seung Jun Yeo, Jeung Sun Ahn

Department of Physics, Kyunghee University, Seoul 130-701

We discovered the formation of C60 aggregates in solution by means of photoluminescence spectroscopic study on C60 in solutions. From the in-depth investigation of temperature dependence of the luminescence of C60 in toluene, benzene and CS<sub>2</sub> solutions, we reported that the C60 aggregates are formed during cooling at the freezing temperature of these solvents. Furthermore, the C60 aggregates can be changed to stable structures by irradiating with UV pulse-laser (Nd:YAG laser, 355nm). As a consequence, we could obtain nano-scale photo-polymerized C60 clusters, which appear as round-shaped nano-scale particles in high resolution transmission electron-microscopy (HRTEM) images. However, the yield of the nano-scale C60 clusters obtained by this method is too small. So we designed and developed a system to obtain C60 cluster of macroscopic quantity by using ultrasonic nebulizer. In this system, C60 solution was vaporized to several micro-sized droplets in vacuum, resulting in the formation of C60 aggregates by evaporating solvent (toluene). The system was invented to produce nano-scale carbon clusters by the irradiation of UV light upon C60 aggregates in vacuum. We have characterized the products, C60 cluster, obtained from the system by using UV absorption spectra and HPLC spectra. Although the products have a possibility of inclusion various forms of C60 cluster, results support that the product formed from the system by using vaporizer method establishes a new method to obtain C60 cluster in macroscopic quantity. In the presentation, the details of the system and the results of characterization are reported.

**Keywords:** Fullerene, C60, Cluster, Polymerization, Nano