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Synthesis and photo-polymerization of C₆₀ fullerene nano-whiskers

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Fullerene nano-whiskers (FNWs) are thin needle-like crystals with diameters less than 1000 nm, and are composed of fullerene molecules such as C₆₀, C₇₀, Sc₃N@C₈₀ and so forth. Among various FNWs, C₆₀ (fullerene) nano-whiskers (C₆₀NWs) have been most minutely investigated in the field of semiconductor devices like field-effect transistors, solar cells, chemical sensors and photo sensors. C₆₀NWs easily become superconductors by doping alkali metals such as K and Rb. The superconducting transition temperature (T_c) of Rb-doped C₆₀NWs is 26 K, which is much higher than the boiling point of hydrogen (20 K). In the future, the Rb-doped C₆₀NWs might be widely utilized as lightweight and flexible super-conductors, using the hydrogen coolant. The FNWs have been normally synthesized by the liquid-liquid interfacial precipitation (LLIP) method. The LLIP method is a very facile technique that utilizes the precipitation and inters diffusion between the good solvent solution of fullerene and its poor solvent. The as-synthesized C₆₀NWs by LLIP method comprise the C₆₀ molecules weakly bound via Vander Waals bonding forces. However, the C₆₀ molecules can be polymerized by irradiation of light, and the physical and chemical properties of C₆₀NWs can be modified by the light irradiation. In the presentation, the structural characteristics of photo-polymerized C₆₀NWs will be discussed, using high-resolution transmission electron microscopy (HRTEM), EELS and Raman spectroscopy.

Biography

Kun'ichi Miyazawa received DE degree from The University of Tokyo in 1987. He was a Lecturer of School of Engineering, The University of Tokyo from 1989 to 2002 and moved to National Institute for Materials Science (NIMS) in 2002. He has been studying the synthesis, characterization and application of low-dimensional fullerene nanomaterials such as fullerene nano-whiskers, fullerene nano-tubes and fullerene nano-sheets.

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