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Carbon Nano Dots (CND) – A New Kid on the Carbon Block Their Synthesis, Quantum Properties, and Applications

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Carbon nano dots, as a new carbon nano structure, have drawn a great deal of attention recently. It shows a similar property as compound semiconductor quantum dots but the structure- property relationship of this material and electron energy transition mechanisms involved in this material have not been clearly identified yet. So far, numerous top-down and bottom- up approaches have been tried but it is still challenging to make a mono-dispersed nanoparticle without agglomeration because carbon forms a very strong covalent bonding with each other. A soft-template synthesis method will be introduced to make nearly mono-dispersed carbon nanoparticles with well passivated stable interface. Chemical structure and morphology of the particle was analyzed with XPS, FT-IR, NMR, Raman and TEM. Photoluminescence properties of this nano dot was revealed and femtosecond laser system was used to study the electron energy transition mechanism (band structure) of this material. It appears that sp^2 core formed in the carbon nano dot acts as a chromophore (發色團) and chemical functional groups attached on the surface acts as a passivating agent and as a auxochrome (助色團). Effect of the dot size and the functional group on the color and quantum efficiency will be discussed. Preliminary studies on the application of this material as a fluorophore for lighting and LED, solar cell, photocatalyst and optical transistor will be discussed.



主催： 東京大学大学院工学系研究科「機械システム・イノベーション」プログラム
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