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New generation nano copper/carbon composite and applications

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Biological systems found in nature provide excellent examples of highly controlled and organized architectures that generate complex materials. Using these materials and their unique microstructures as templates to produce nano-structured materials can result in some special results that manmade templates can rarely/can't achieve at current time.This presentation will demonstrate an innovative technology to produce the copper-carbon-core-shell nanoparticles (CCCSNs) using cellulose as templates (US Patent No.: US8,828,485 B2). The technology relies on reducing the Cu^{+2} ions by absorbing them in the cellulose $(C_6H_{10}O_5)n$ structures of natural fibers and then, going through carbonization and refining processes to produce the CCCSNs. In contrast to the conventional methods, the nanoparticles made from this technology are core/shell structures in nature and dispersible in both water and organic solvents (such as oil) with very low cost. CCCSNs possesses many special properties that commercially available copper nanoparticles couldn't have. CCCSNs have high physical/chemical stabilities and form the $Cu<=>Cu_2O$ equilibrium system without forming cupric oxide, which is significant since cuprous oxide is an optical catalyst material with relatively low bandgap (2.137eV).The most unique property is the regeneration behavior of CCCSNs, when treated with reducing environment, the $Cu<=>Cu_2O$ system will return to pure copper status with no significant changes in particle size distribution or core-shell structure. Because of the excellent stability, superior performance and low cost, CCCSNs have been tested as anti-bacteria; anti-termite; anti-algea and as an optical catalyst for volatile organic compounds (VOC) treatment reagents and achieved outstanding results.

Biography

Kun Lian, Obtained his M.S. and Ph.D. in Material Science and Engineering from Louisiana State University, in 1992 and 1995 respectively. Lian worked as Post-doctoral Research Follower at University Michigan at Ann Arbor after receiving his Ph.D. from 1997, Kun Lian jointed Center for Advanced Microstructures and Devices, Louisiana State University/Southern University; as Assistant Professor, Associate Professor and Professor. In 2012, Lian jointed School of Nano-Science and Nano-Engineering, Suzhou, Xi'an Jiaotong University as professor and deputy dean until now.

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