17p-S1-8

Chemical route for highly conductive carbon nanotube and graphene electrode

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Highly concentrated colloidal suspensions of high-quality nanocarbon (NC) materials are of great interest for a variety of applications ranging from flexible electronics and flexible textile electronics to electrochemical catalysts for energy harvesting or storage devices. One of the key technical challenges in NC materials science is to overcome the difficulties associated with dispersion and with processing such NC materials for further applications.

Here, we demonstrate a method for fabricating printable, spinnable, and chemically compatible conducting pastes containing CNTs and reduced graphene oxide nanoplatelets in organic solvents without the need for additional dispersion agents. Highly dispersed NC suspensions with >10% weight concentrations in absence of organic dispersants are successfully achieved by functionalizing the NC materials with supramolecular quadruple hydrogen bonding motifs without sacrificing the electrical conductivity as shown in Figure 1. Compared with conventional methods, the synthetic methods reported here make possible the preparation of high-quality NC materials with much higher levels of processability, electrical conductivity, and chemical compatibility.

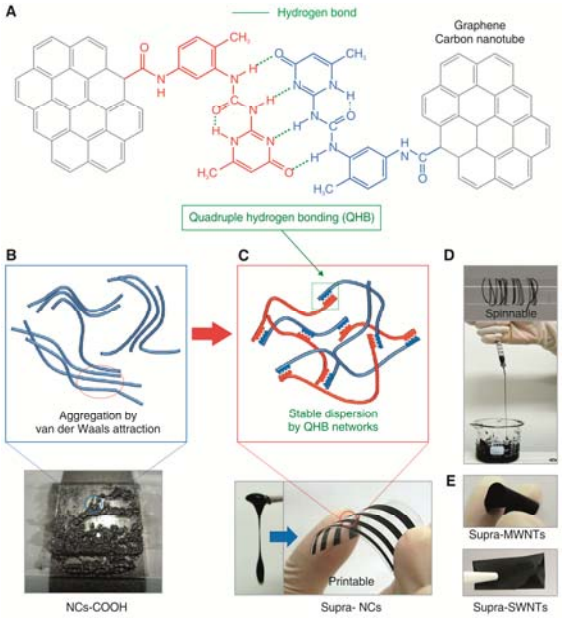

Figure 1. (A) The chemical structure of the QHB network based on UHP moieties. (B) Photograph and schematic illustration of an unstable colloidal suspension of NCs-COOH prepared without a dispersant. (C) Photographs of drop (left), printed film (right), and schematic illustration of a stable supra-NC paste. (D) Photograph of spinnable supra-NC pastes. (E) Images of flexible CNT bucky papers.