Carbon nanotubes (CNTs) have superior mechanical and electrical properties that have opened up many potential applications. However, poor dispersibility and solubility, due to the substantial van der Waals attraction between tubes, have prevented the use of CNTs in practical applications, especially in biotechnology applications. Effective dispersion of CNTs into small bundles or individual tubes in solvents is crucial to ensure homogeneous properties and enable practical applications. In addition to dispersion of CNTs into a solvent, the selection of appropriate solvent, which is compatible with a desired matrix, is an important factor to improve the mechanical, thermal, optical, and electrical properties of CNT-based composites. In particular, dispersion of CNTs into an aqueous system has been a challenge due to the hydrophobic nature of CNTs. Here we show an effective method for dispersion of both single wall CNTs (SWCNTs) and few wall CNTs (FWCNTs) in an aqueous buffer solution. We also show an assembly of cationized Pt-cored ferritin on the well-dispersed CNTs in an aqueous buffer solution.

**Buffers Studied**

- MOPS: N-[2-hydroxyethyl]-piperazine-N'-2-ethanesulfonic acid
- HEPES: N-(2-hydroxyethyl)piperazine-N'-2-ethanesulfonic acid
- AMPSO: 3-(N-morpholino)propanesulfonic acid
- TWEEN® 20: Polyoxyethylene sorbitan monolaurate
- NaDDBS: Sodium dodecylbenzene sulfonate

**Photos of initial HiPCO SWCNT dispersion in the various buffers:**

- MOPS (0.05 M (1.05 wt. %) with 0.025 M NaCl (0.15 wt. %), pH 7.5) solution containing SWCNT at 0.125 mg/ml and phosphate (0.05 M (0.5 wt. %) with 0.025 M NaCl (0.15 wt. %), pH 7.2) containing SWCNT at 0.05 mg/ml. All samples were taken after sonication for 20, 30, and 60 min.

**Photos of initial HiPCO SWCNT dispersion in MOPS buffer (0.1 M with 0.05 M NaCl, pH 7.5) containing SWCNT at 0.1 mg/ml.**

**Photos of initial dispersion state before and after sonication for 30 min and then after sitting for 60 min.**

**Photos of initial dispersion state before and after sonication for 30 min and then after sitting for 60 min.**

**Summary**

We demonstrated high performance electrodes for oxygen reduction using CNTs coropated with uniformly populated platinum nanoparticles generated by the reconstitution of ferritin proteins. These electrodes were achieved by effectively dispersing CNTs into the aqueous MOPS buffer containing Pt-cored cationized ferritin. Nano-sized Pt-cored ferritin on CNTs displayed good catalytic activity for the electrochemical reduction of oxygen which is applicable to biofuel cell and fuel cell applications.

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