Supplementary Material (ESI) for Journal of Materials Chemistry

Supporting Information

BN Nanotube Coated with Uniformly-Sized/Placed Fe_3O_4 Nanoparticles: Novel Magneto-Operable Nanocomposites

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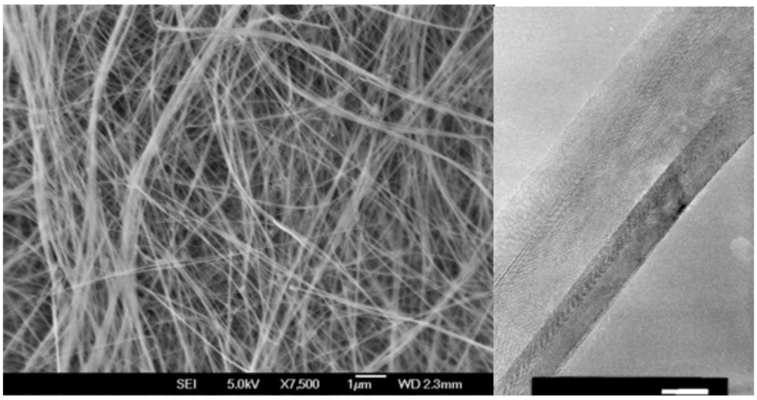

Figure S1. SEM image of the as-prepared BNNTs of high purity. TEM image showing the smooth surface and perfect crystallization of a representative BNNT.

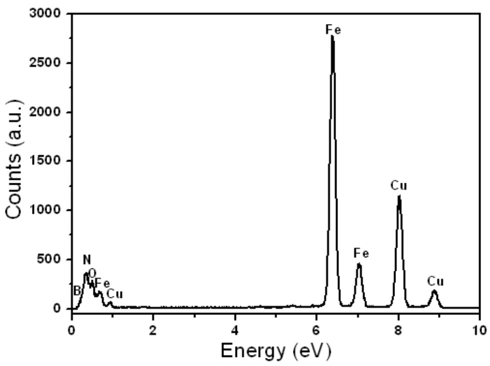

Figure S2. EDS of the Fe_3O_4/BNNT nanocomposites obtained after the ethanol-thermal reactions at 175°C over 9 h and illustrating that the composites consist of B, N, Fe, and O. The Cu peaks are from the copper TEM grid.

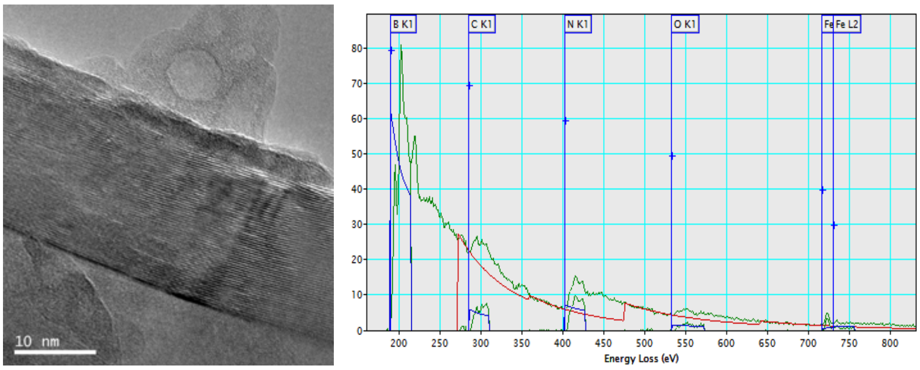

Figure S3. High-resolution TEM image showing the originally amorphous nature of the coating in a nanocomposite obtained after the ethanol-thermal reactions at 175 °C for 3.5 h. EEL spectrum indicating that the amorphous substance consists of Fe, O, and C.

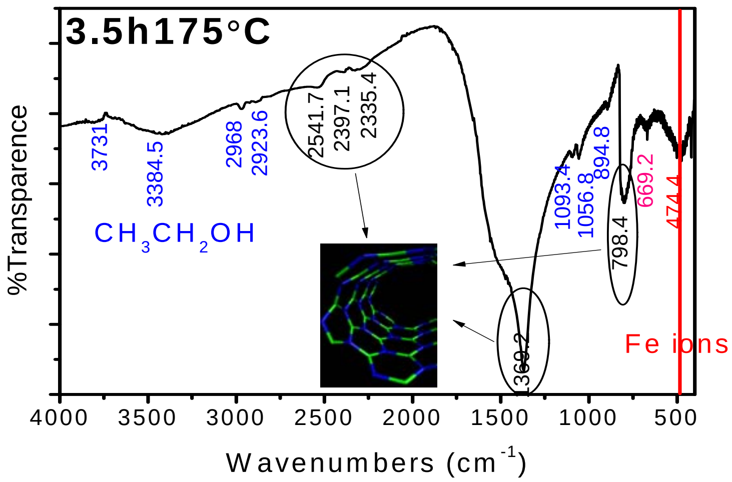

Figure S4. The FTIR spectrum of a nanocomposite obtained after the ethanol-thermal reactions at 175°C over 3.5 h showing the identified absorption peaks which can be divided into those peculiar to three groups: 1) CH_3CH_2OH, 2) BNNTs and 3) Fe^{3+} ions. The absence of the absorptions from the other functional groups and/or frameworks suggests that the association of Fe^{3+}, CH_3CH_2OH and BNNTs is likely due to the coordination bonds.

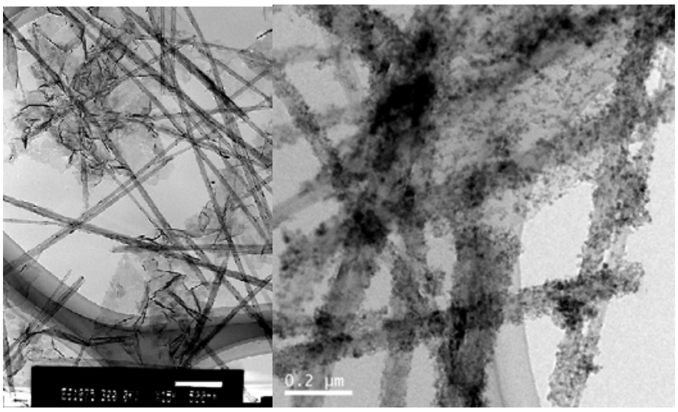

Figure S5. Being accompanied by the vigorous ultrasonic dispersion before coating, the BNNTs might be partially broken. This resulted in the BNNTs with shorter lengths (~15 μm) and some other BN layered structures (flake- or sheet-like). The BN fragments can also be coated/attached to the Fe_3O_4 nanoparticles during the ethanol thermal reaction. Such phenomenon additionally suggests that the present coating of Fe_3O_4 is not structure- or defect-related, but reflects the intrinsic nature of h-BN in the ethanol thermal conditions.

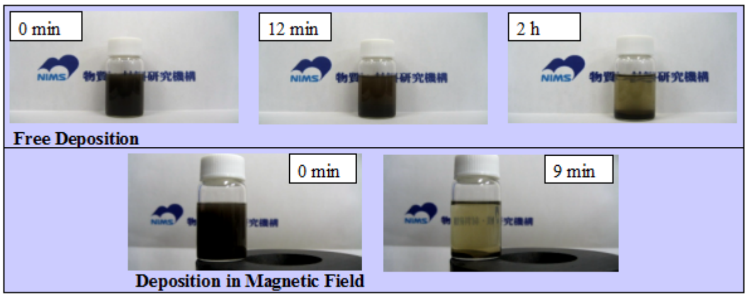

Figure S6. The natural deposition process of the Fe_3O_4/BNNT nanocomposites could also be drastically accelerated using a loudspeaker magnet (more than 20-fold). Normally, the deposition process takes more than 2 hours, while it speeds up in the presence of a loudspeaker magnet and only takes about 9 min. Considering a high surface to volume ratio of the ultra-fine Fe_3O_4 nanoparticles, the behavior observed here guarantees that such nanocomposites have potential applications in cell separation and environment treatment.