Enhanced electrocatalytic performance of functionalized carbon nanotube electrodes for oxygen reduction in proton exchange membrane fuel cells

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Solid state ^{31}P-NMR measurements of P-MWCNT

Solid state ^{31}P-NMR measurements show an almost same peak position for phosphorous atom in both P-MWCNTs and amino ethyl phosphonic acid (AEP). This demonstrates that the bonding between AEP and MWCNT is through amide linkage while the phosphonic acid group remains free in the chain end thus no change in its immediate chemical environment.

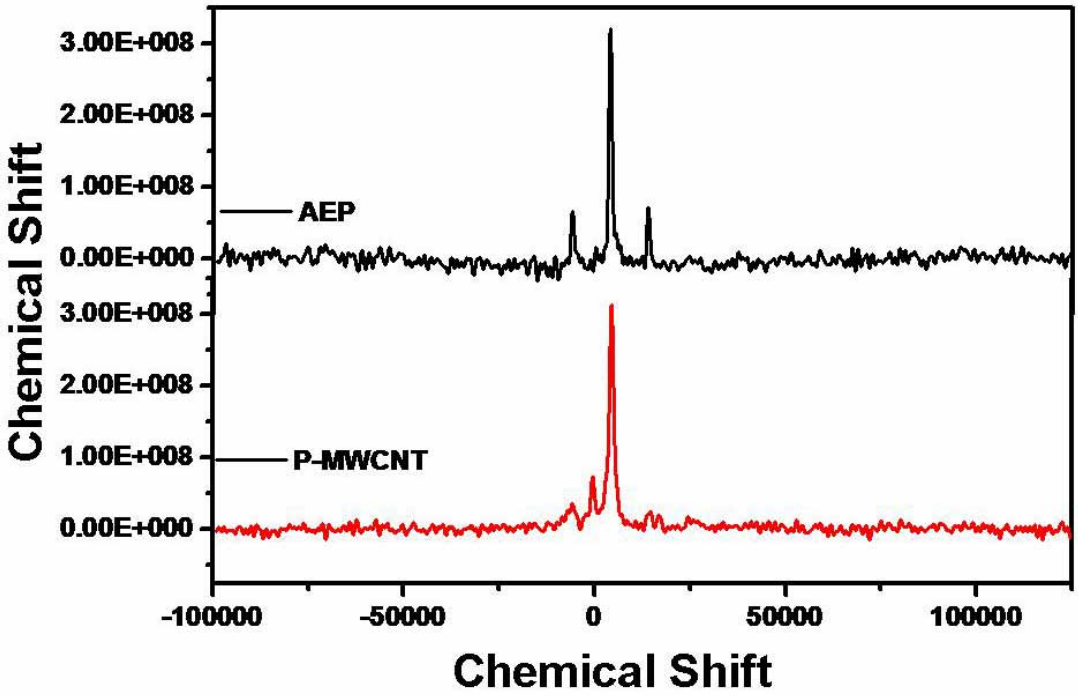

Figure S.1. Solid State 31P-NMR plot obtained for AEP and P-MWCNTs.

TGA of H-MWCNT and S-MWCNT under N_2 atmosphere

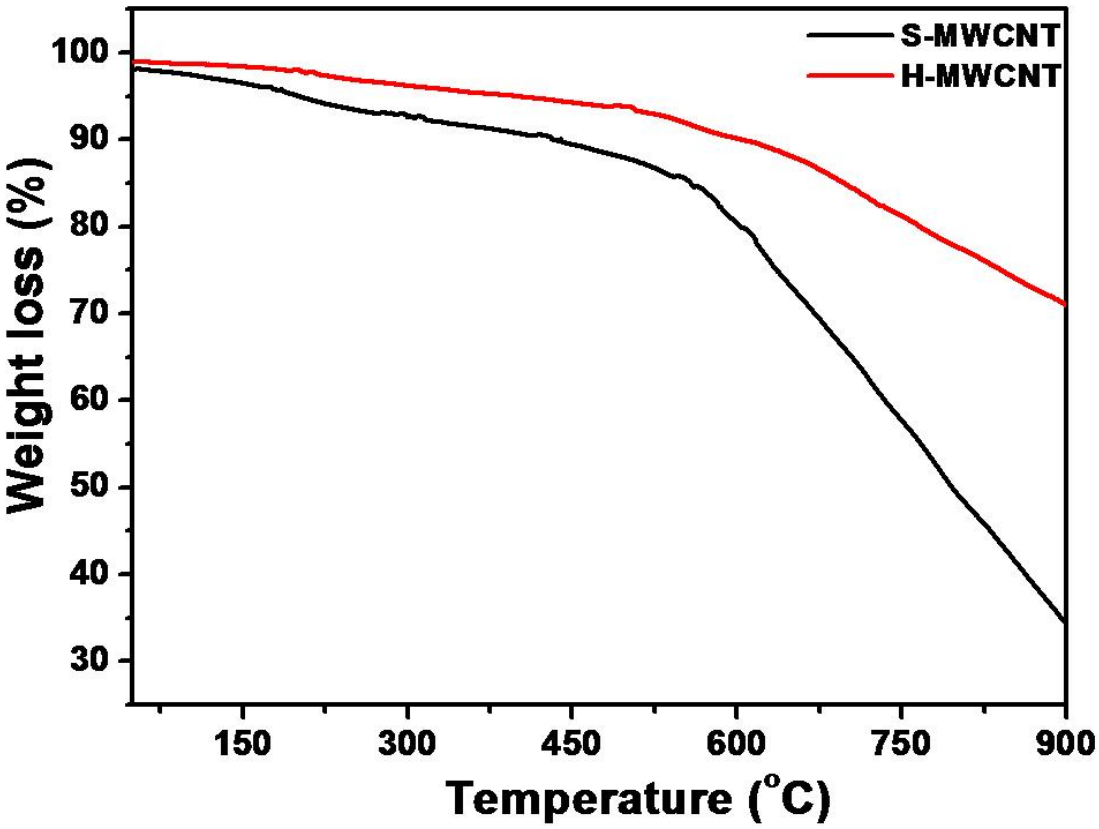

Figure S.2. Thermogravimetric plots obtained for H-MWCNTs and S-MWCNTs in N_2 atmosphere in the temperature range of 50 to 900 °C.

TGA of H-MWCNT and S-MWCNT under O_2 atmosphere

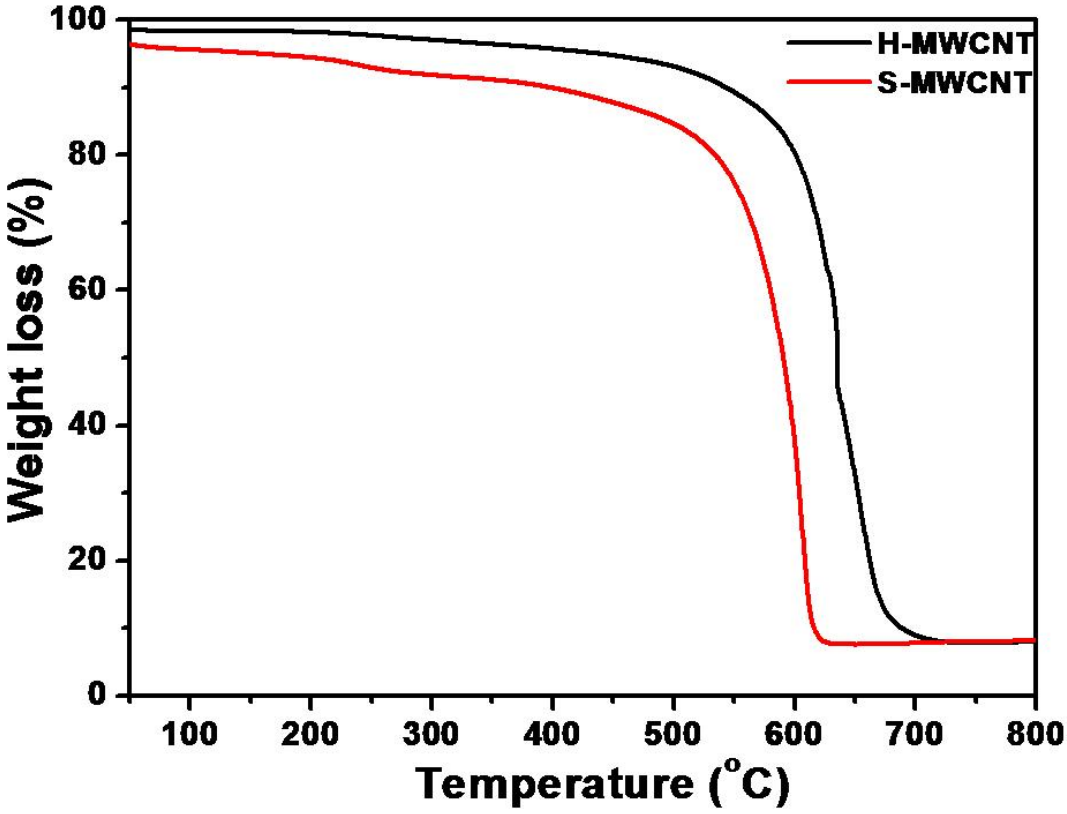

Figure S.3. Thermogravimetric plots obtained for H-MWCNTs and S-MWCNTs in O_2 atmosphere in the temperature range of 50 to 800 °C.