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Supporting Information

Experimental and theoretical studies on the mechanism for chemical oxidation of multiwalled carbon nanotubes

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1. Morphology studies

TEM micrographs of MWCNTS treated by two different oxidation methods are shown on Figure 1. The oxidation effect (qualitative and quantitative) cannot be distinguish by TEM studies very well, however a higher number of exfoliated O-MWCNTs was observed after reflux treatment comparing to other protocols described in this work.

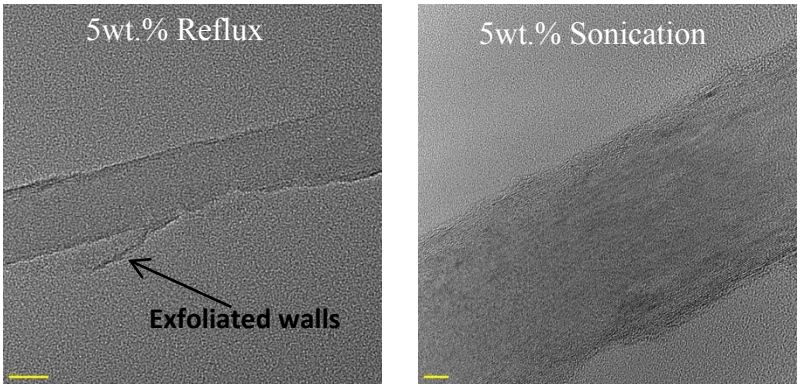

Figure 1. TEM micrographs of MWCNTs (with 5wt.% of iron catalyst) oxidized by two different methods: reflux and sonication treatment.

1. Separation protocols

The length separation method for all oxidized samples was completed using centrifugation procedure. Figure 2 shows SEM micrographs of separated O-MWCNTs. The accurate length statistics based on SEM technique was completed.

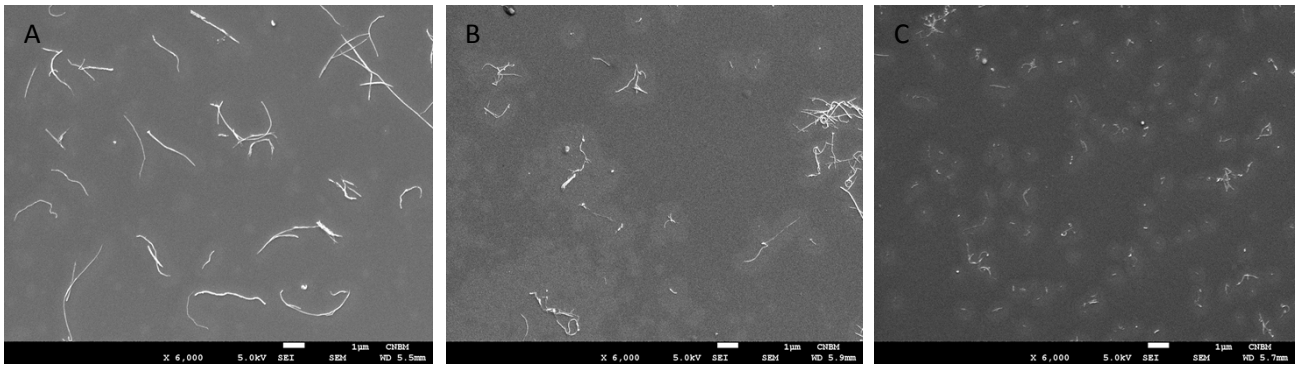

Figure 2. Three different sizes of refluxed oxidized 2%-MWCNTs for sample after separation.

2. Thermal Analysis

Thermal analysis allowes to examine the existance of different functionalities on the MWCNT outerwalls. The thermal analisis was carried out in the range of temperature from 20°C to 1000°C with 5°C step in air. Mass loss in the vicinity of 127°C corresponds to evaporation of the adsorbed water within the sample, wheres the weight loss at 400°C is caused by elimination of hydroxyl functionalities attached to the MWCNT walls. Finnaly, at 600°C thermal oxidation of amorrphous carbon residues occures [1,2](Figure 3).

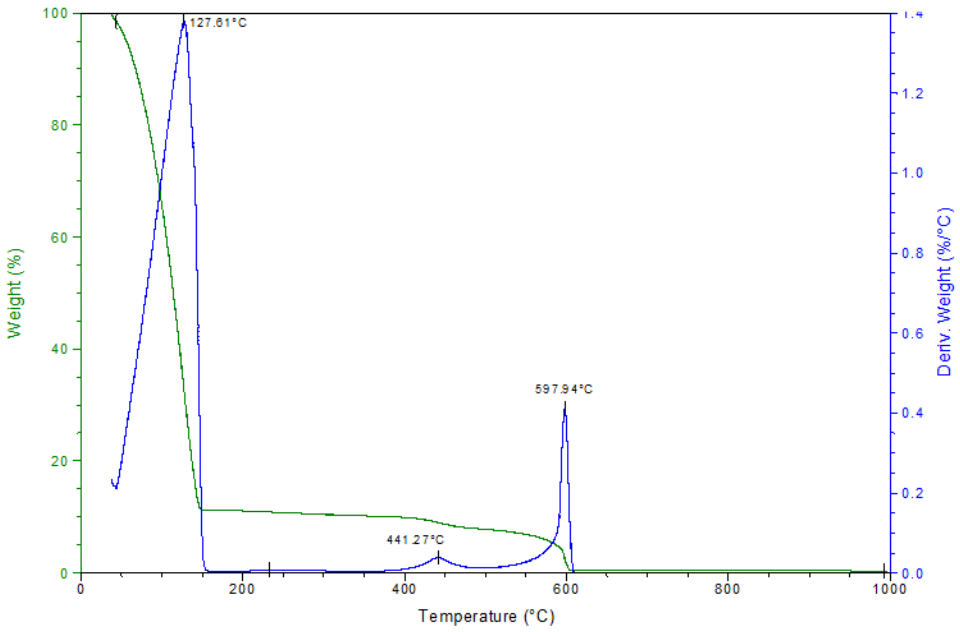

Figure 3.An example of thermal analysis data for O-MWCNTs with 5wt.% of catalyst after reflux treatment.

References:

[1] Krzysztof Koziol, Ph.D. Thesis, Carbon nanotube polymer scaffolds, University of Cambridge, Cambridge, UK

[2] F. Yang, M. Zhao, B. Zheng, D. Xiao, Li Wu,Y. Guo Influence of pH on the Fluorescence Properties of Graphene Quantum Dots Using Ozonation Pre-oxide Hydrothermal Synthesis., J. Mater. Chem., 2012, 22, 25471–25479. (see Supporting Information).