Supplementary Material

Oxidation of N-doped multiwalled carbon nanotubes and formation of discontinuous spiraled carbon nanoribbons

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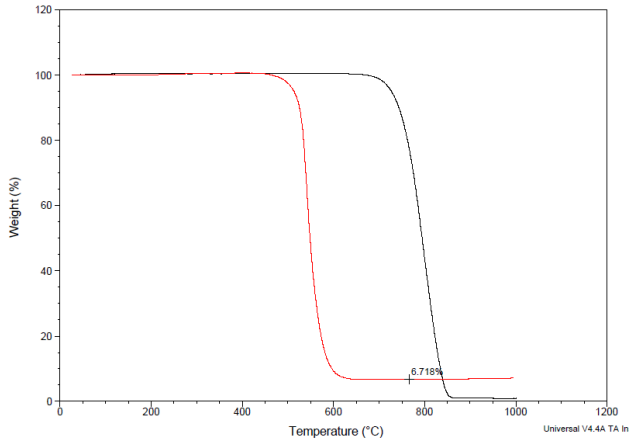

Figure S1. TGA plot comparing as-produced N-MWCNTs (red) with thermally annealed N-MWCNTs (G-N-MWCNTs).

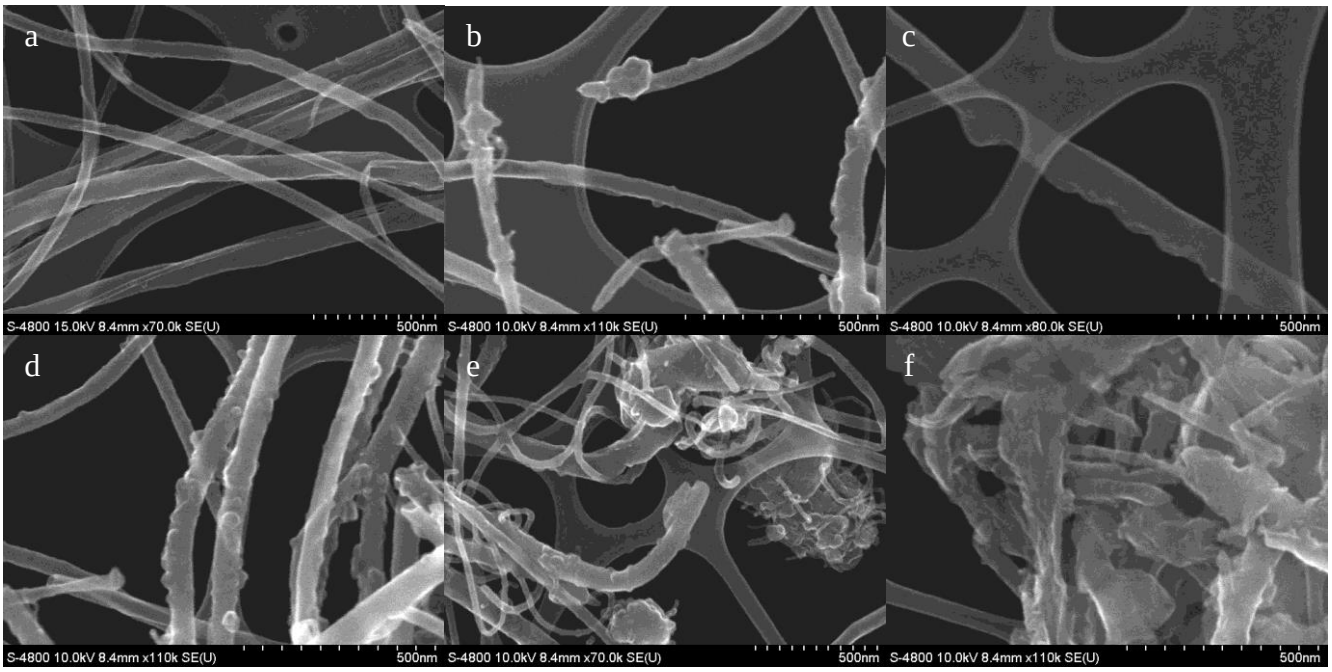

Figure S2. SEM images of G-N-MWCNTs treated with conc. HNO_3 after: a) 6h; b), and c) damages (surface etching and exfoliation) observed in few tubes after 6h; d) and e) 12h and f) 24h.

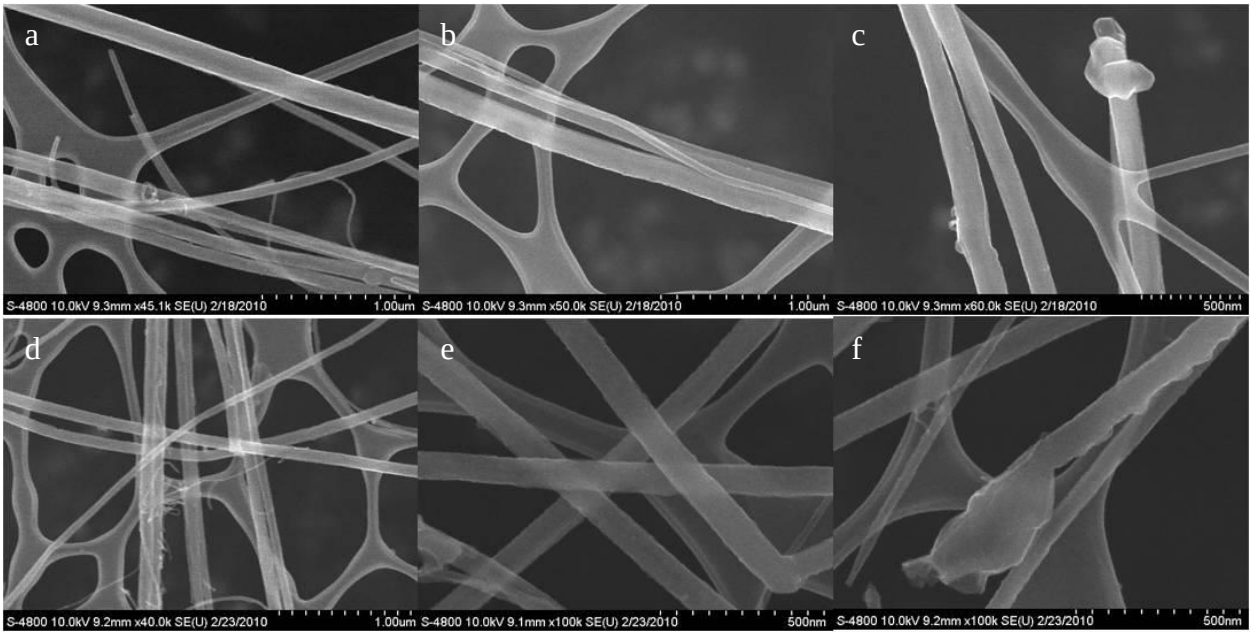

Figure S3. SEM images of G-N-MWCNTs treated with piranha solution after: a), b) & c) 12h ; d), e) & f) 24h.

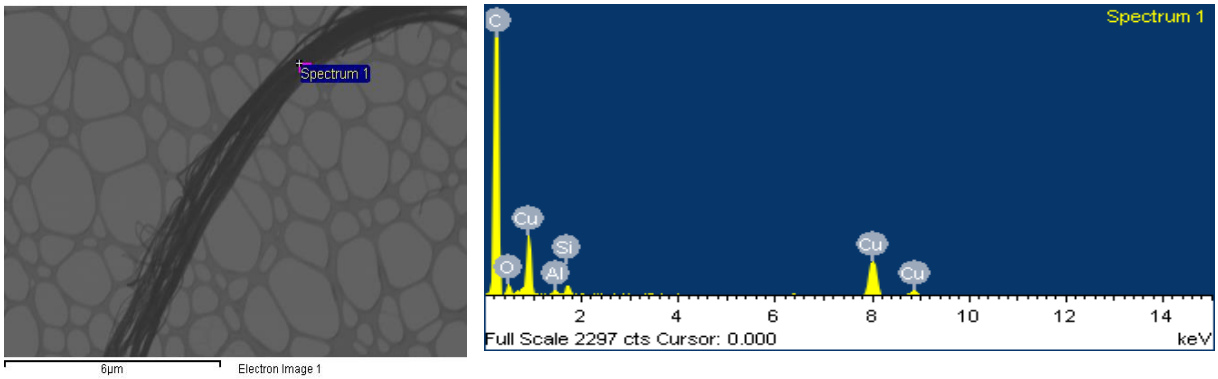

Figure S4. EDX on Fenton oxidized tube showed mostly carbon and no signs of Fe (Cu from Cu grid, Al from sample holder, small amounts of Si is residue from quartz tube furnace.

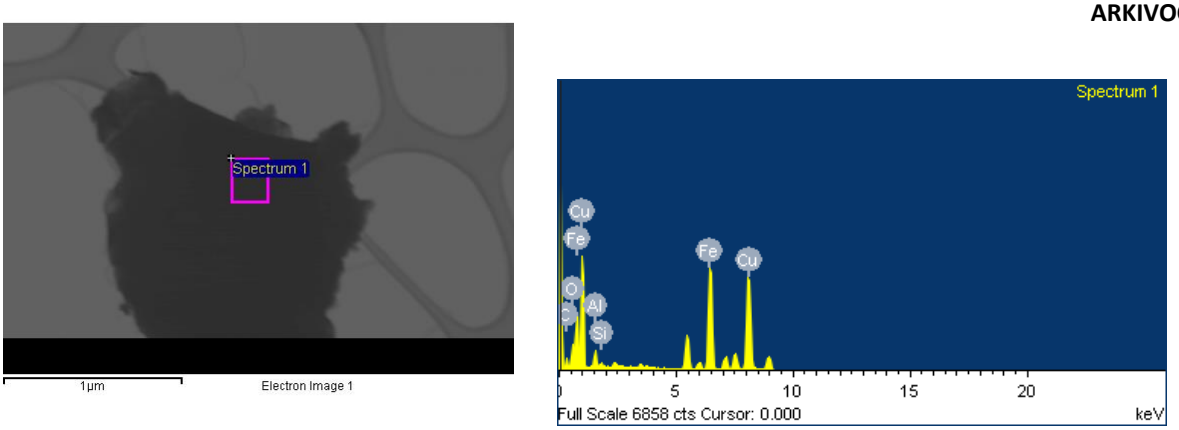

Figure S5. EDX on large fragments in Fenton oxidized tubes. (average carbon (16 %) signal may be from lacey carbon) (Cu from Cu grid, Al from sample holder, small amounts of Si is residue from synthesis, and small un-labeled peaks are Cr and Ca).

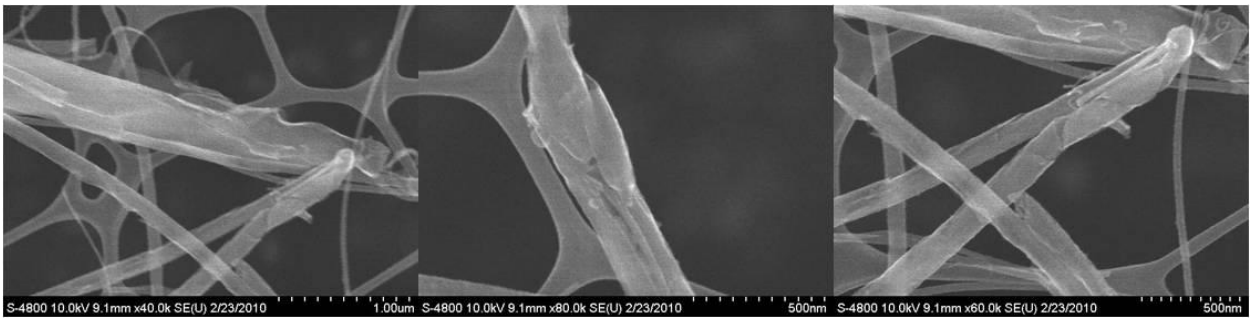

Figure S6. SEM images of G-N-MWCNTs treated with H_2SO_4/HNO_3 (stirring for 24h).

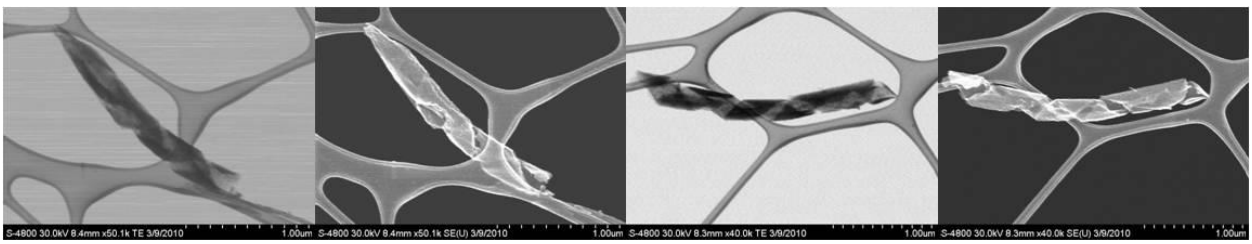

Figure S7. STEM and SEM images of G-N-MWCNTs treated with H_2SO_4/HNO_3 (sonication for 24h).

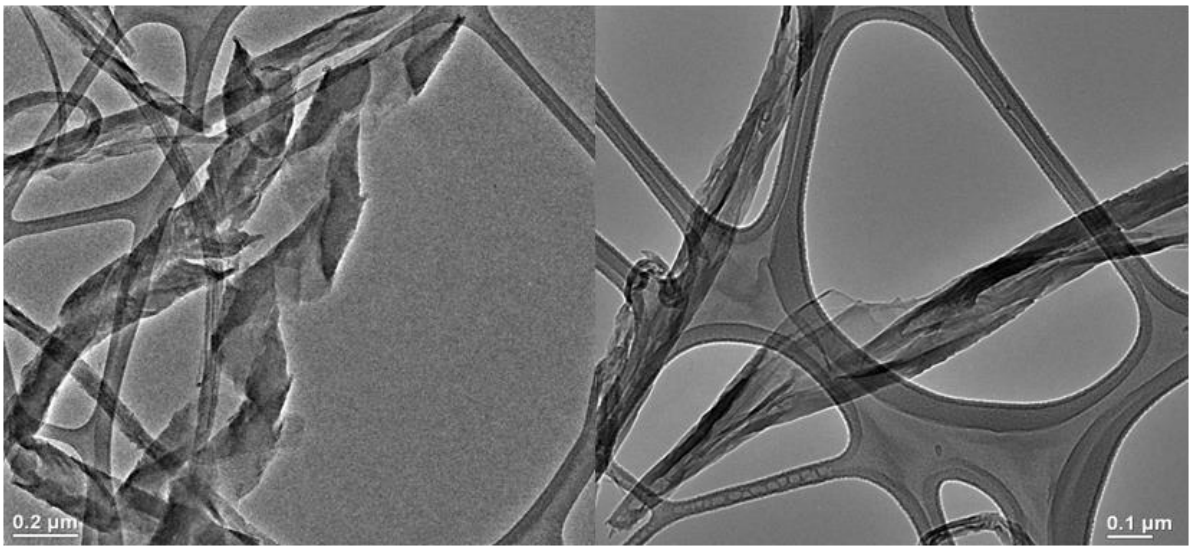

Figure S8. TEM images of $KMnO_4/H_2SO_4$ oxidized G-N-MWCNTs.

Table S1. Table reporting onset temperature of oxidation, temperature of maximum rate of oxidation and % residue (residue is because of Si, which is believed to be present in starting tubes during their synthesis).

Sample	Onset temperature of oxidation of remaining carbon (° C)	Temperature of maximum rate of oxidation (° C)	Wt. % residue
G-N-MWCNTs	666	795	2.5%
HNO_3 oxidized 6h	584	763	2.5%
HNO_3 oxidized 12h	576	758	2.5%
HNO_3 oxidized 24h	557	733	2.5%
Piranha oxidized 12h	666	795	2.5%
Piranha oxidized 24h	646	782	2.5%
Fenton oxidized	577	724	2.5%
H_2SO_4/HNO_3 oxidized 12h	558	704	1.3%
H_2SO_4/HNO_3 oxidized 24h	530	682	1.3%
$KMnO_4/H_2SO_4$ oxidized	510	583	1%