Electronic Supplementary Material (ESI) for RSC Advances
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Nanoscale conductive niobium oxides made through low temperature phase transformation for electrocatalyst support

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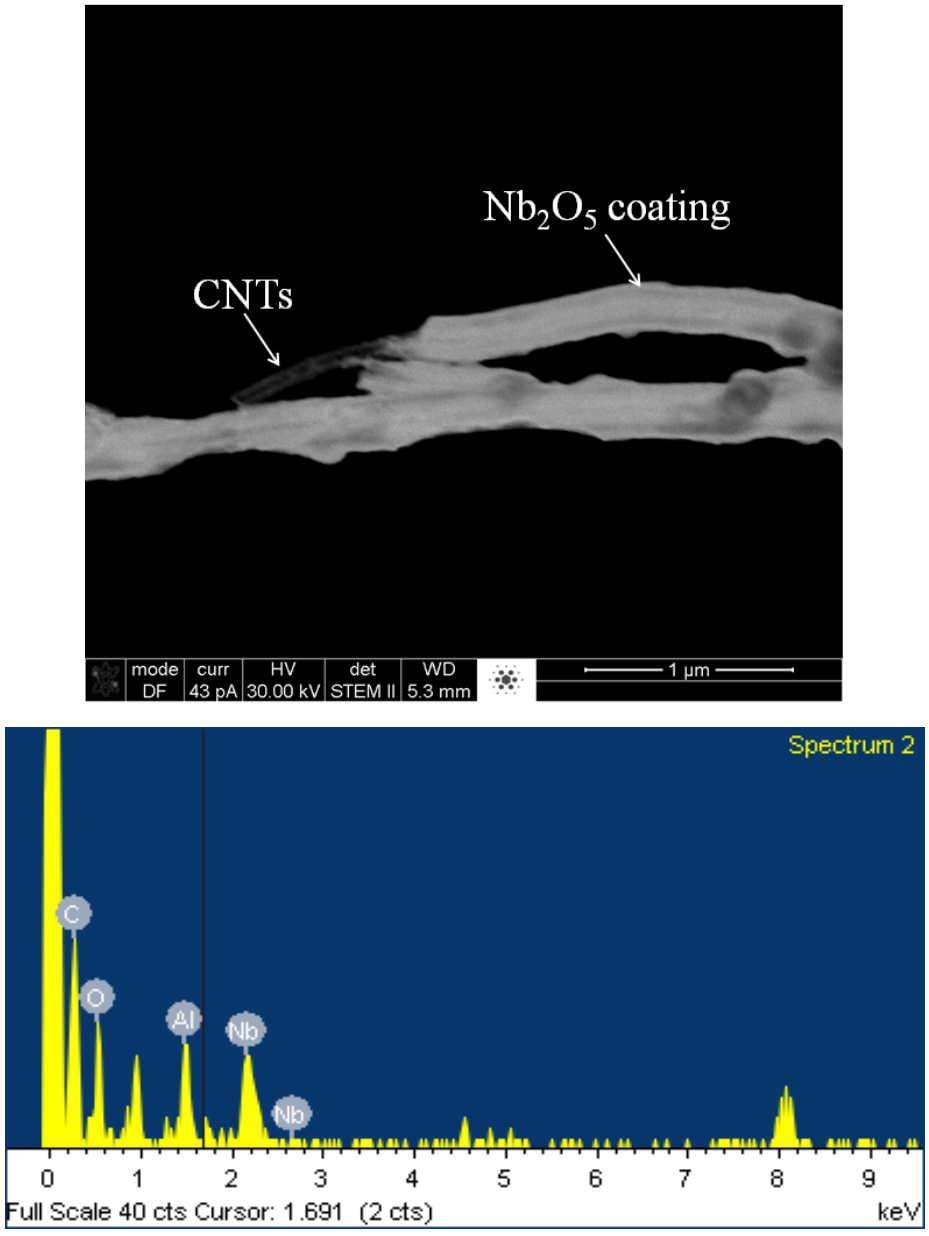

Fig. S1. EDX of Nb_2O_5/CNTs sample supported on a copper mesh TEM grid, showing the presence of Nb element. Some background elements (e.g. Al) of the sample support (TEM grid) are also present.

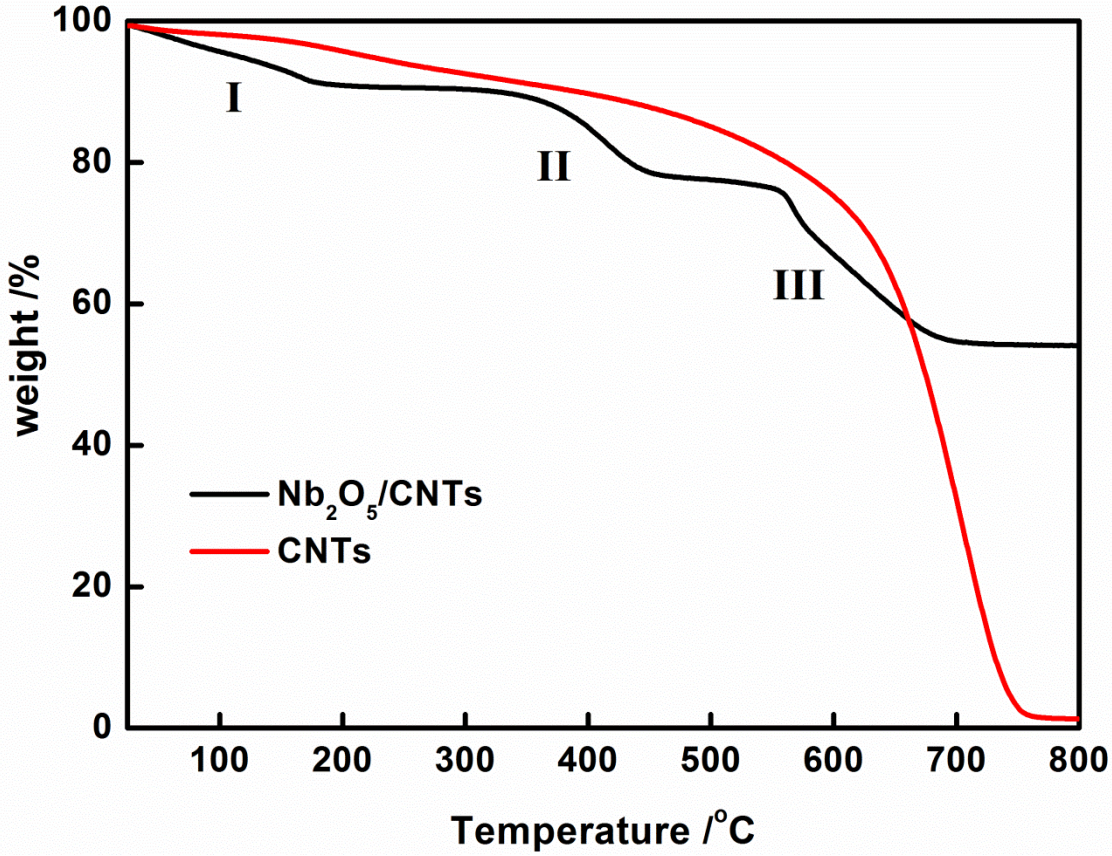

Fig. S2. Thermogravimetric analysis of Nb_2O_5/CNTs and CNTs. The analysis was carried out under air atmosphere with heating rate of 10 °C/min. The featured three stages of Nb_2O_5/CNTs are (I) removal of water and organic solvents, (II) densification of the amorphous Nb_2O_5 network and crystallization from amorphous to H-Nb_2O_5 (Hexagonal), and (III) oxidation of CNTs. Two flat stages between (I)/(II) and (II)/(III) suggest nearly no weight loss. Nb_2O_5 nanocoating is believed to protect CNTs from oxidation at relatively low temperature. Slow weight loss of CNTs starts at beginning and drops quickly beyond 600 °C until completed oxidation.

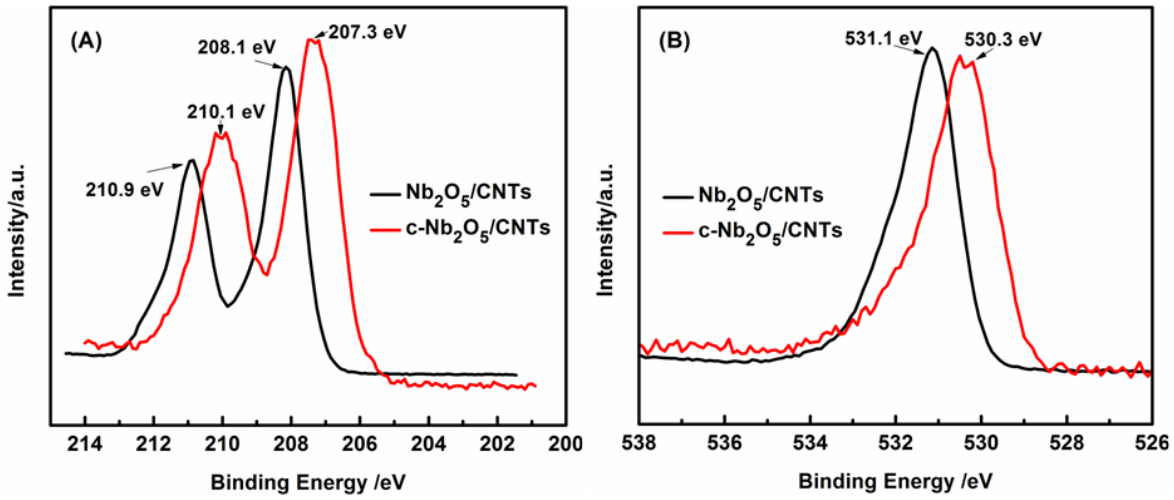

Fig. S3. XPS results of Nb 3d and O 1s from c-Nb_2O_5/CNTs and Nb_2O_5/CNTs. According to U.S. National Institute of Standards and Technology (NIST), Nb $3d_{5/2}$ in Nb_2O_5 and NbO_2 display binding energies (BEs) at 208.1 eV and 205.7 eV, respectively. (A) The Nb 3d BEs in c-Nb_2O_5/CNTs shifts towards lower oxidation state may suggest a formation of reduced oxide layer, and (B) The O 1s found at 530.3 eV in c-Nb_2O_5/CNTs suffers a negative shift compared with Nb_2O_5/CNT at 531.1 eV.