

Supplementary Information

An Electrochemical Investigation of Methanol Oxidation on Thin Films of Nickel Oxide and Its Composites with Zirconium and Yttrium Oxides

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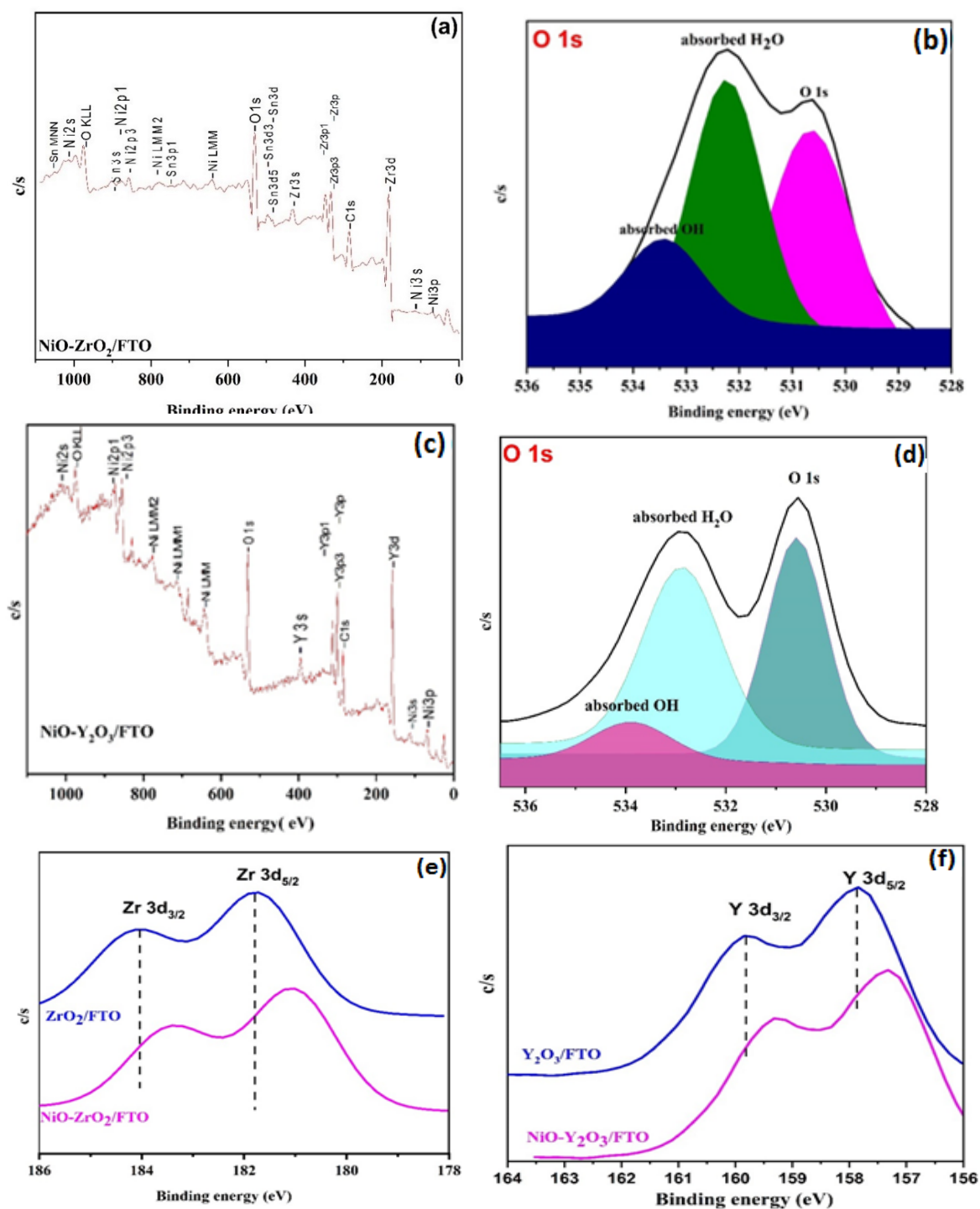


Figure S1. (a) XPS survey scan of NiO-ZrO₂/FTO (b) O1s for NiO-ZrO₂/FTO (c) XPS survey scan of NiO-Y₂O₃/FTO thin film (d) O1s for NiO-Y₂O₃/FTO thin film, and (e-f) Zr3d and Y3d scans of pure oxide films with their respective composite thin films.

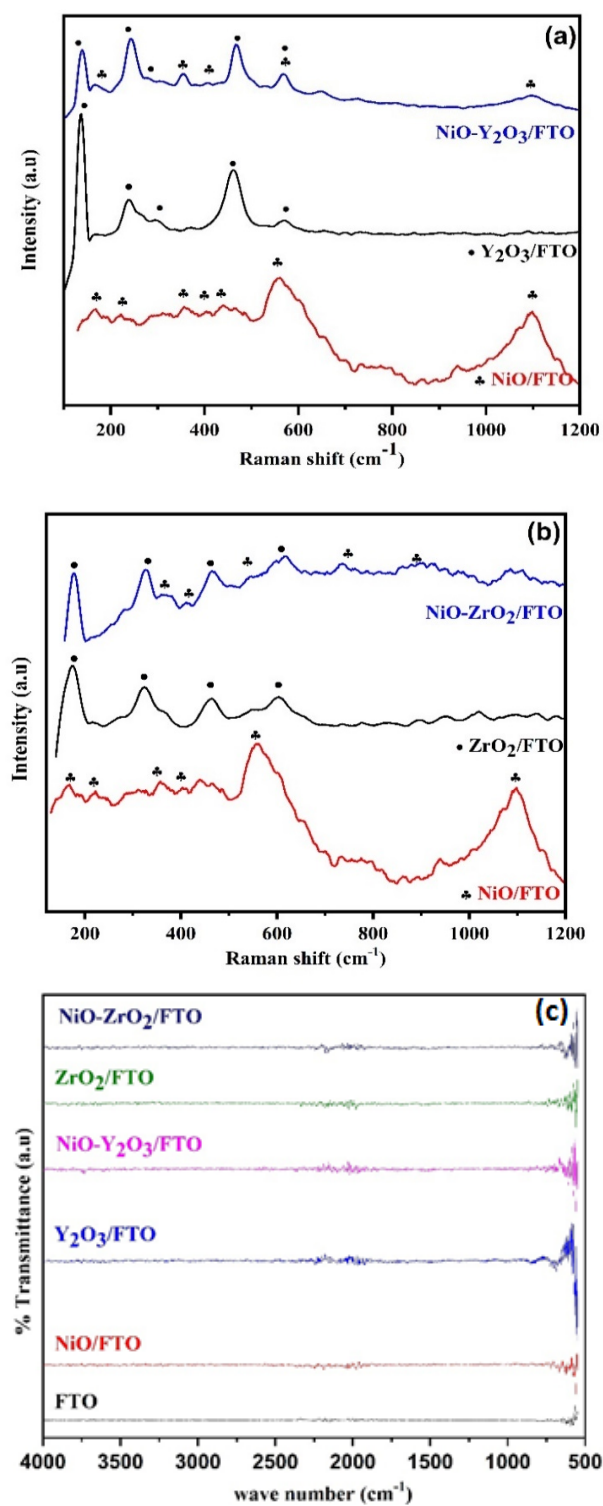


Figure S2. Comparison of Raman spectra of (a) NiO- Y₂O₃/FTO and (b) NiO-ZrO₂/FTO with pure NiO/FTO, Y₂O₃/FTO, and ZrO₂/FTO thin films (c) FT-IR spectra of FTO, NiO/FTO, Y₂O₃/FTO, ZrO₂/FTO, NiO-ZrO₂/FTO, and NiO-Y₂O₃/FTO thin films.

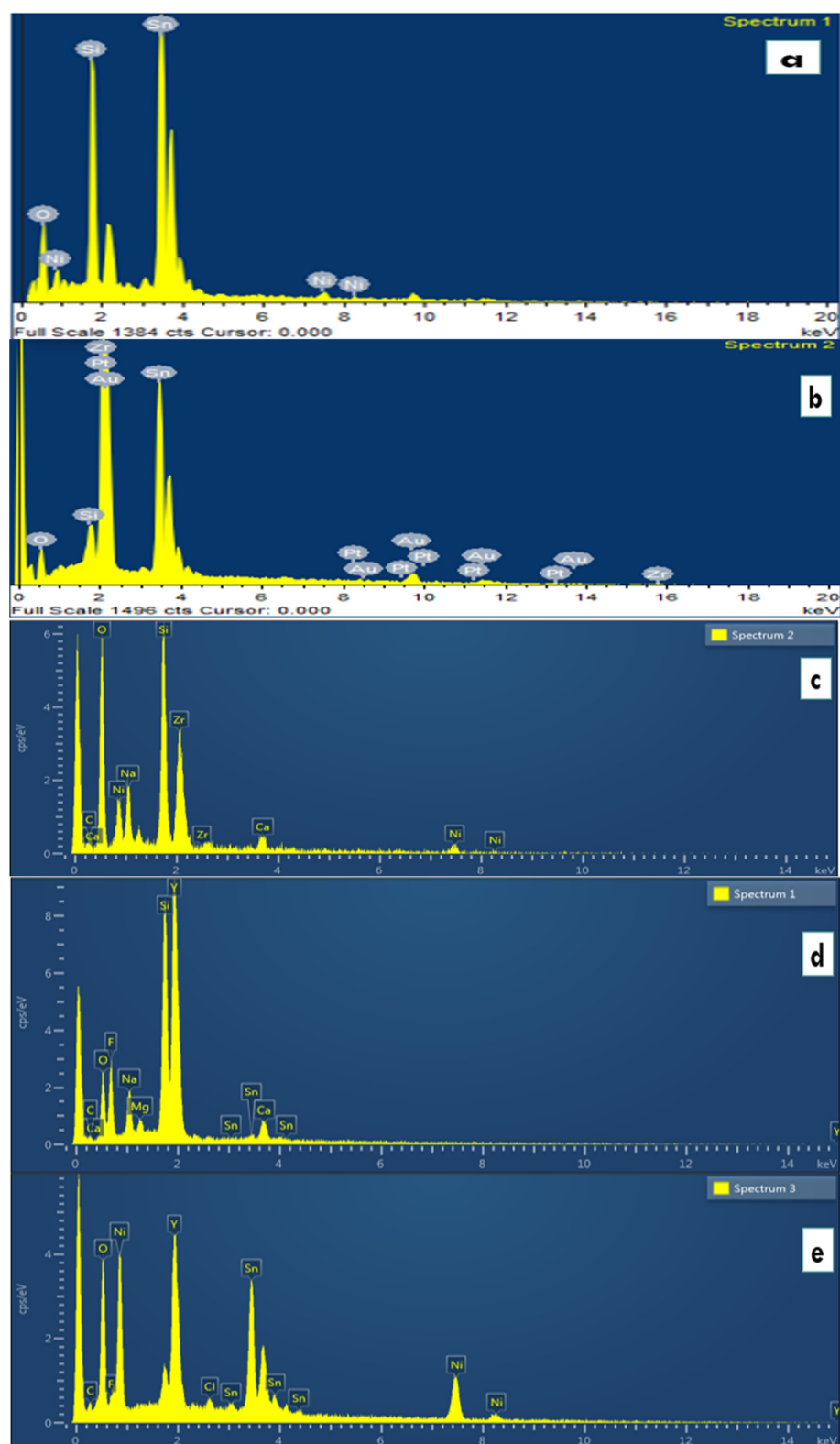


Figure S3. EDS spectra of (a) NiO/FTO (b) ZrO₂/FTO (c) NiO-ZrO₂/FTO (d) Y₂O₃/FTO and (e) NiO-Y₂O₃/FTO.

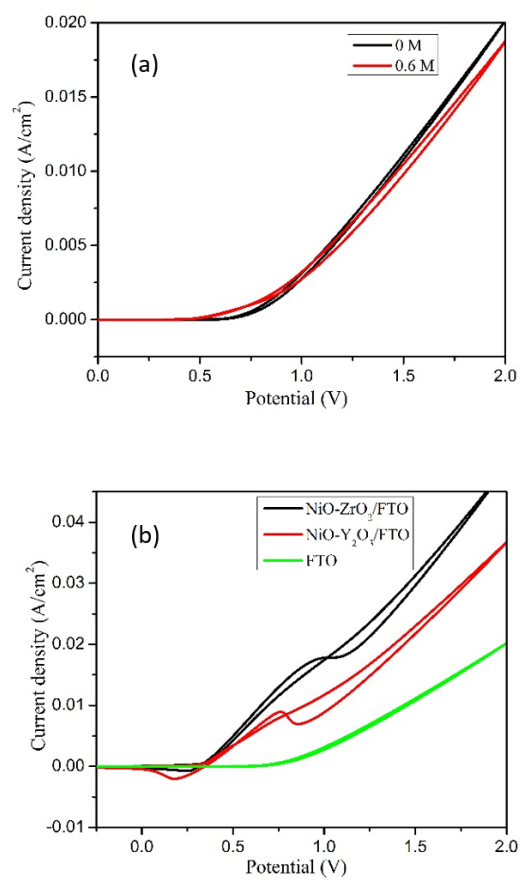


Figure S4. Cyclic voltammetry of bare FTO in the presence and absence of methanol (a) and its comparison of methanol oxidation with NiO-ZrO₂/FTO and NiO-Y₂O₃/FTO composite films (b).

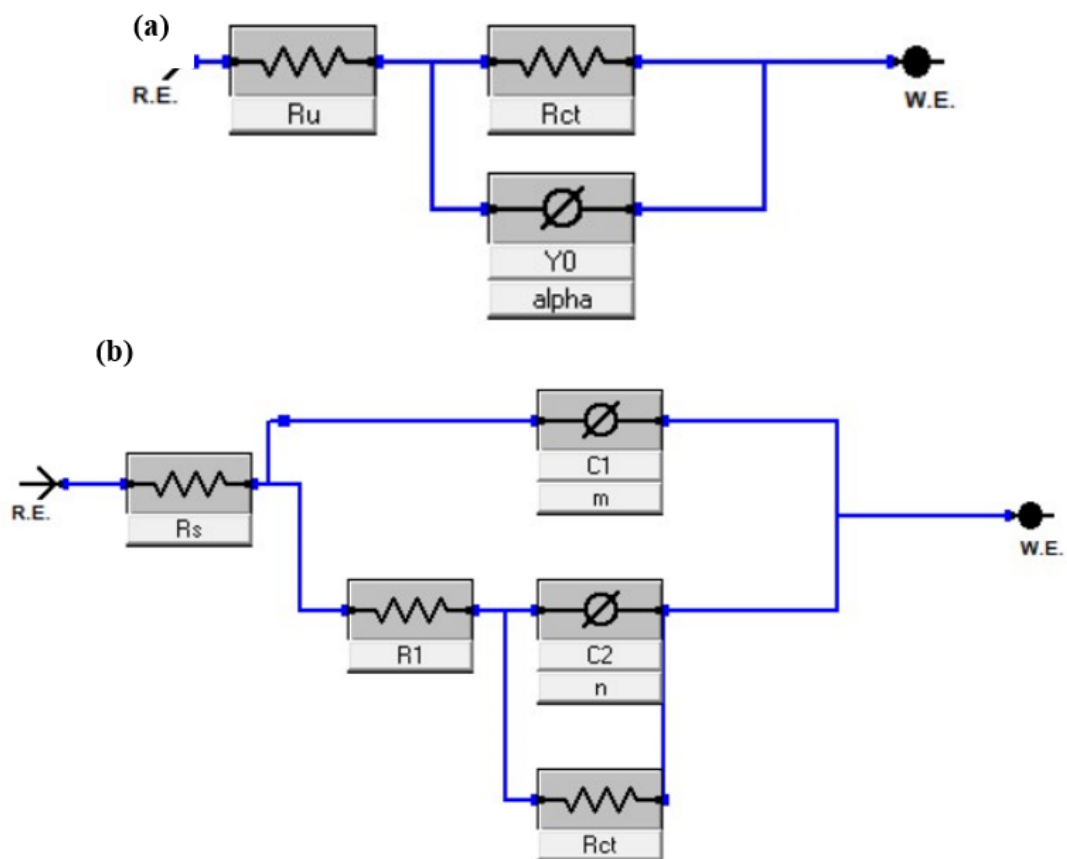


Figure S5. Equivalent circuit models obtained from an excellent fit with the experimental data of (a) ZrO_2 and (b) NiO , $NiO-ZrO_2$, Y_2O_3 , and $NiO-Y_2O_3$ films.