

Synthesis Process:

Ferromagnetic NWs and NTs were synthesized by conventional electrodeposition method. Electrodeposition was performed potentiostatically with three electrode cell, where saturated calomel electrode (SCE, KCl) and Platinum foil was used as reference and counter electrode, respectively. On the other hand, anodized aluminum oxide with seed layer of Au (200nm) served as working electrode. The electrochemical solution used for Ni nanowires is 0.34 M NiSO₄·6H₂O and 0.32 M H₃BO₃ with the addition of 0.01 M Fe₂(SO₄)₃ for Ni₈₀Fe₂₀ nanowires. Whereas, 0.034 M solution of NiSO₄·6H₂O was used for Ni nanotubes and 0.001 M Fe₂(SO₄)₃ for Ni₈₀Fe₂₀ nanotubes. The electrodeposition process was continued for 1h at reduction potential of -1 V for all cases.

Sample Preparation:

In order to get clean morphology (SEM analysis) of embedded core-shell NWs and NTs into the nano-channel AAO templates. It was necessary to release them via wet chemical etching process. AAO template containing embedded nanostructure was immersed in 0.5 M NaOH aqueous solution for 2 h for the dissolution of template. The core-shell structure was still in contact with gold seed layer (to support NWs and NTs), afterwards, the samples were doubly washed in DI water carefully.

For TEM analysis, procedure for the dispersion of NWs and NTs is different than SEM. 0.6 M KI and 0.1 M I₂ aqueous solution was firstly used to remove gold seed layer. Afterwards, AAO template was completely dissolved in a solution of CrO₃ (1.8 wt.%) and H₃PO₄ (6 wt.%) in room temperature for 24 h. Free standing core-shell NWs and NTs were then initially in DI water and then in isopropyl alcohol. Finally, drop of final product was dispersed on front side of carbon coated TEM copper grid.

Powder form of FTO nanotubes was obtained after adopting the above procedure for XRD characterization to get crystal phase information properly. On the other hand, as prepared samples of core-shell embedded NWs and NTs were structurally analyzed by XRD and magnetically measured by VSM and PPMS.

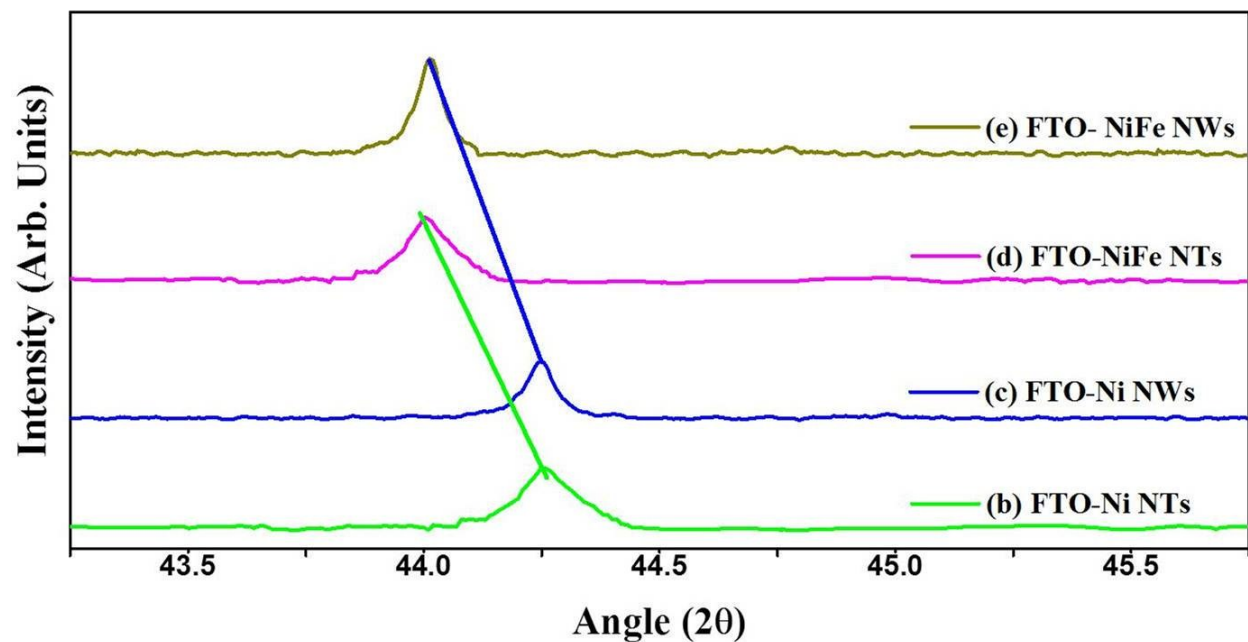


Fig. S1: XRD pattern of FTO-Ni/Ni₈₀Fe₂₀ core-shell nanowires and nanotubes

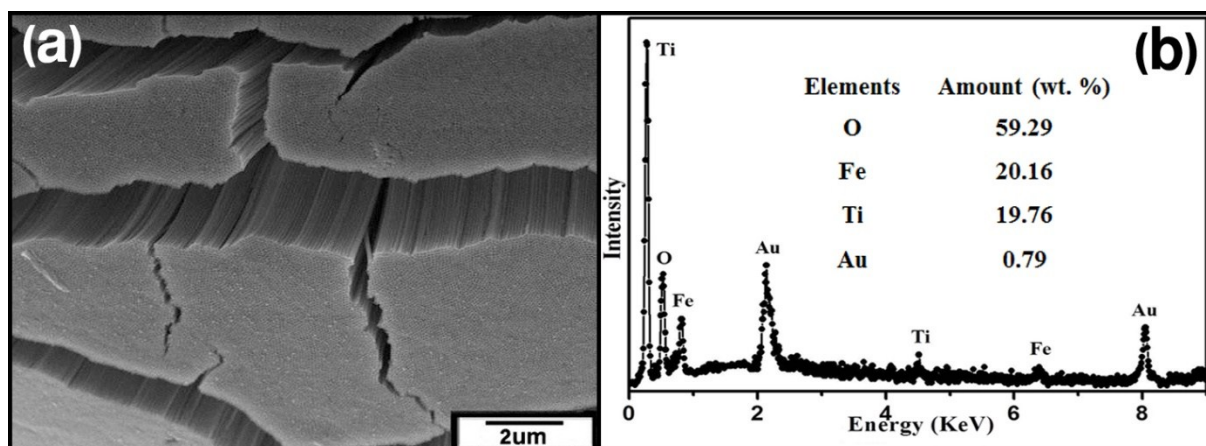


Fig. S2: (a) SEM micrograph of FTO nanotubes (b) EDS of FTO nanotubes

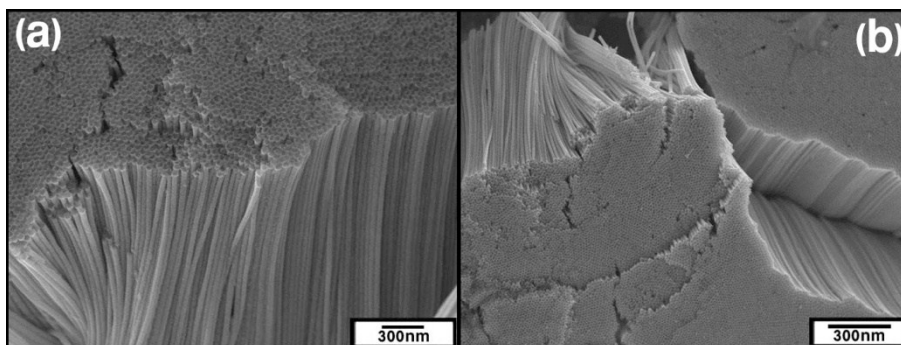


Fig. S3: (a) SEM micrograph of FTO-Ni core-shell nanowires (b) SEM of FTO/Ni₈₀Fe₂₀ core-shell nanowires

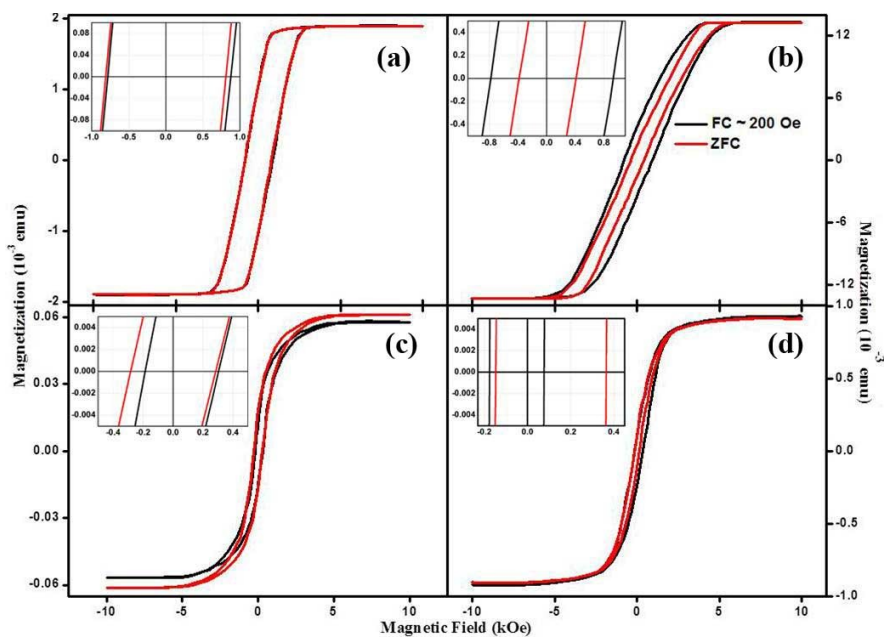


Fig. S4 FC and ZFC M-H loop of (a) FTO-Ni core-shell nanowires (b) FTO-Ni core-shell nanotubes (c) FTO-Ni₈₀Fe₂₀ core-shell nanowires (d) FTO-Ni₈₀Fe₂₀ core-shell nanotubes after field cool under 1T field.

