Electronic Supplementary Material (ESI) for Sustainable Energy & Fuels.

TiO_2 pillaring and NiO_x loading as alternatives for the photoactivity enhancement of $K_2Ti_4O_9$ towards water splitting†

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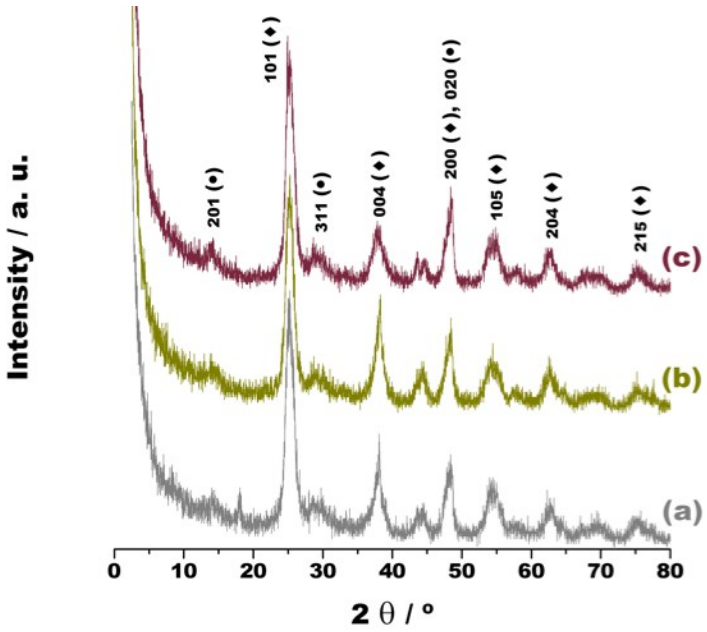

Fig. S1 X-ray diffraction patterns of the materials (a) $Ag/TiO_2/Ti_4O_9$, (b) $Au/TiO_2/Ti_4O_9$, and (c) $Pt/TiO_2/Ti_4O_9$.

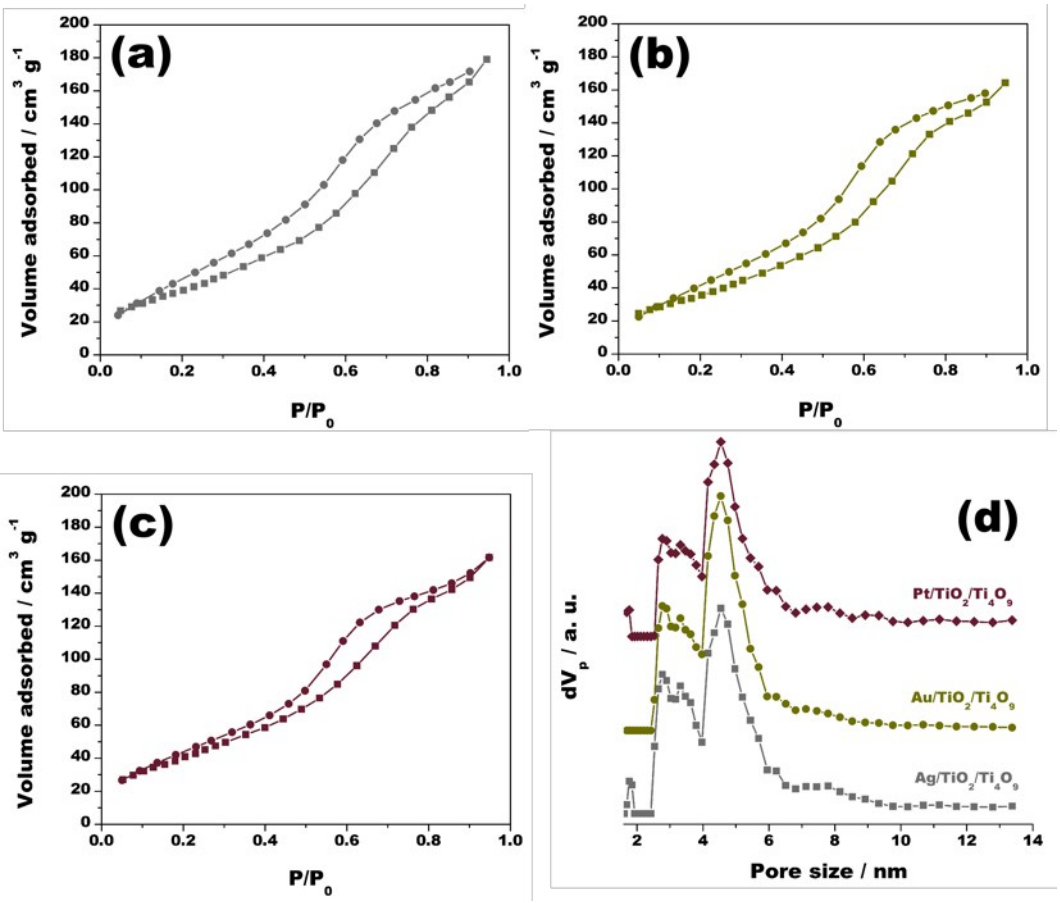

Fig. S2 N_2 adsorption-desorption isotherms of the mesoporous solids (a) $Ag/TiO_2/Ti_4O_9$, (b) $Au/TiO_2/Ti_4O_9$, and (c) $Pt/TiO_2/Ti_4O_9$; and (d) respective pore size distribution curves.

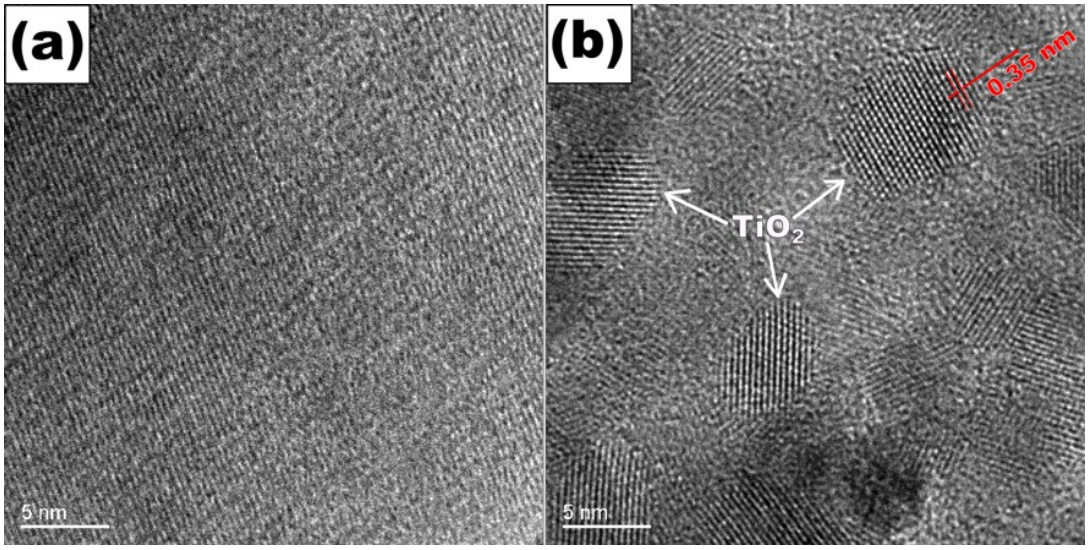

Fig. S3 High-resolution transmission electron microscopy (HR-TEM) images of (a) $K_2Ti_4O_9$ and (b) TiO_2/Ti_4O_9.

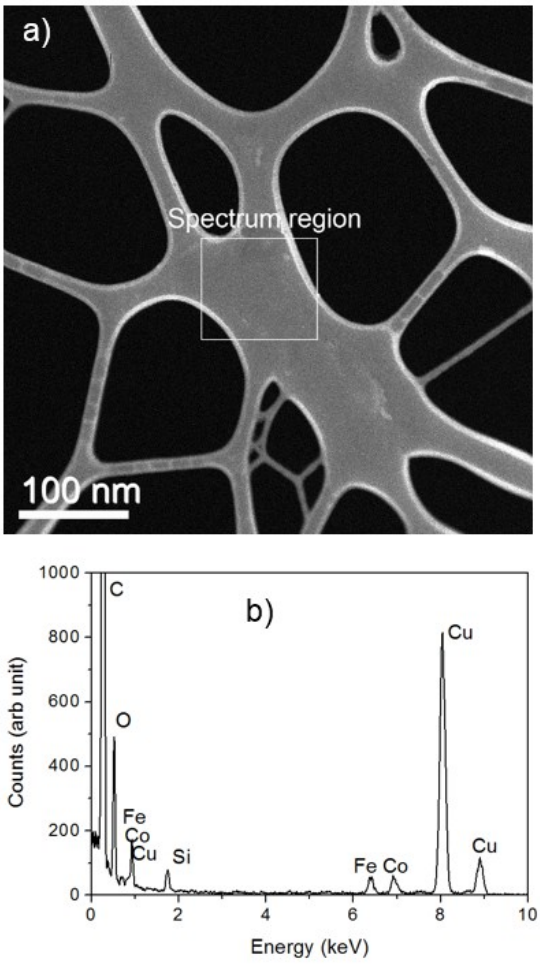

Fig. S4 TEM image and EDS spectrum of the grid used for the surface mappings of $NiO_x/TiO_2/Ti_4O_9$.

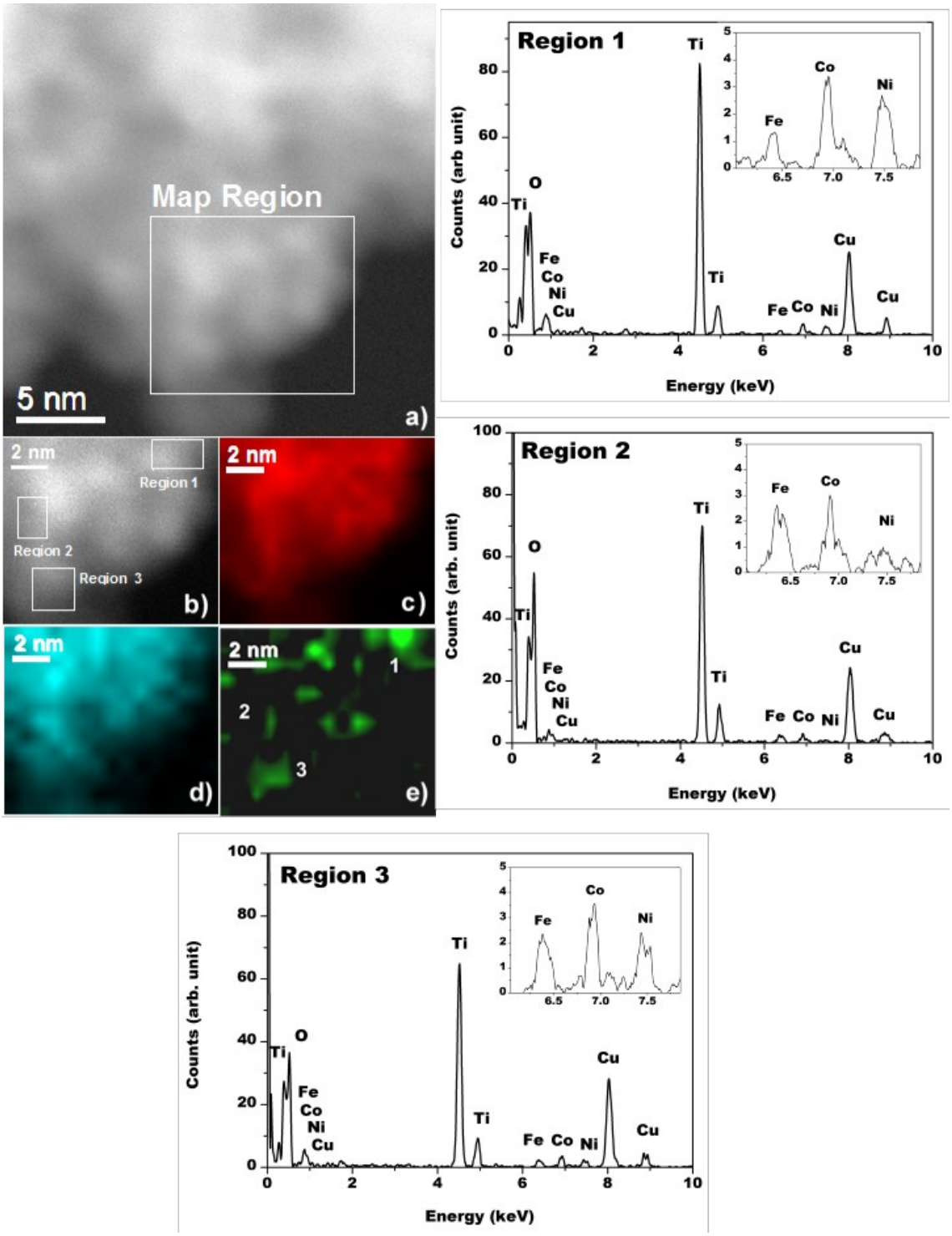

Fig. S5 EDS mapping of (a) and (b) a selected region of $NiO_x/TiO_2/Ti_4O_9$ surface, detecting the elements (c) titanium, (d) oxygen and (d) nickel; and three different EDS spectra correlated to the regions 1, 2 and 3 indicated in (b). The spectra show that Region 1 is rich in nickel, Region 2 has no nickel and region 3 possess nickel in lower amount compared to Region 1. The absence of the peak at 7.5 keV in the spectrum of Region 2 proves that the detected nickel belongs to the sample and not to the grid holder.

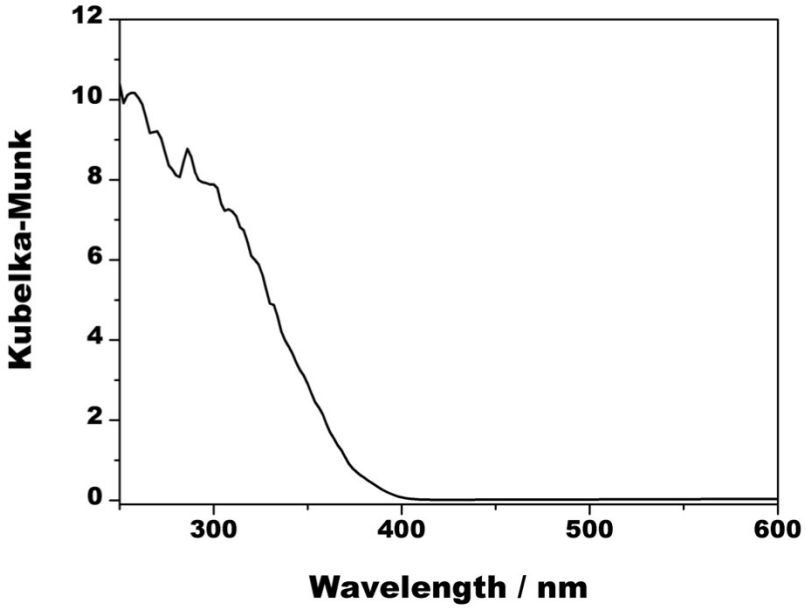

Figure S6. UV-Vis diffuse reflectance spectrum of the synthesized TiO_2 anatase nanoparticles.

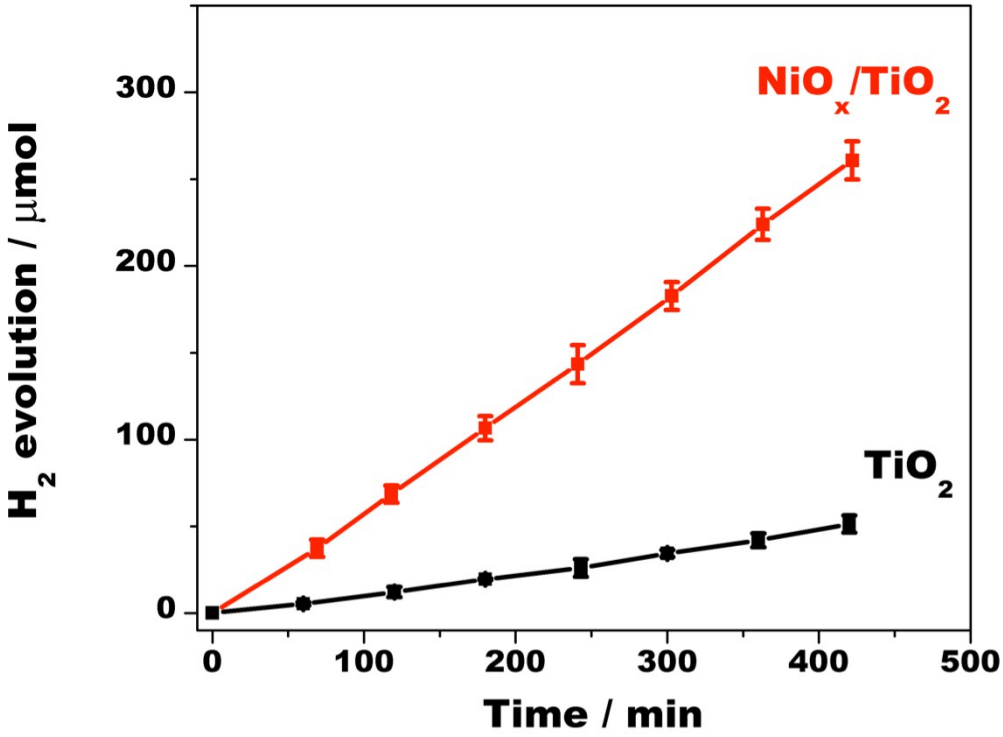

Figure S7. H_2 evolution over 50 mg of TiO_2 P25 and NiOx/TiO_2 suspended in 50 mL of a 20 % (v/v) aqueous methanol solution. The system was irradiated with a 300 W Xe arc lamp with light power of 224 mW cm^{-2}.

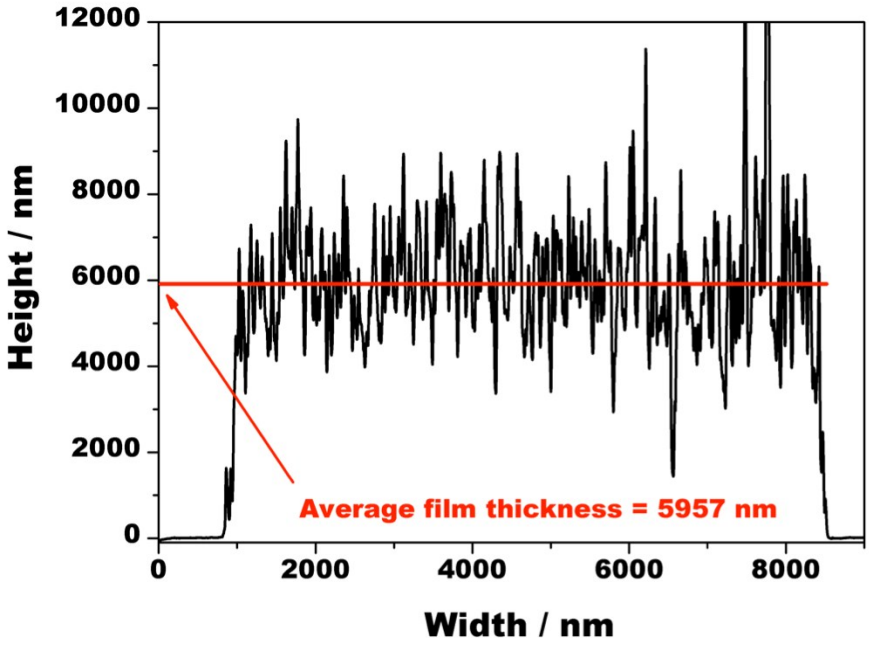

Figure S8. Profilometer scan of one of the TiO_2/Ti_4O_9 films prepared for the SPS measurements.