Supporting Information

Nature of Catalytic Active Sites Present on the Surface of Advanced Bulk Tantalum Mixed Oxide Photocatalysts

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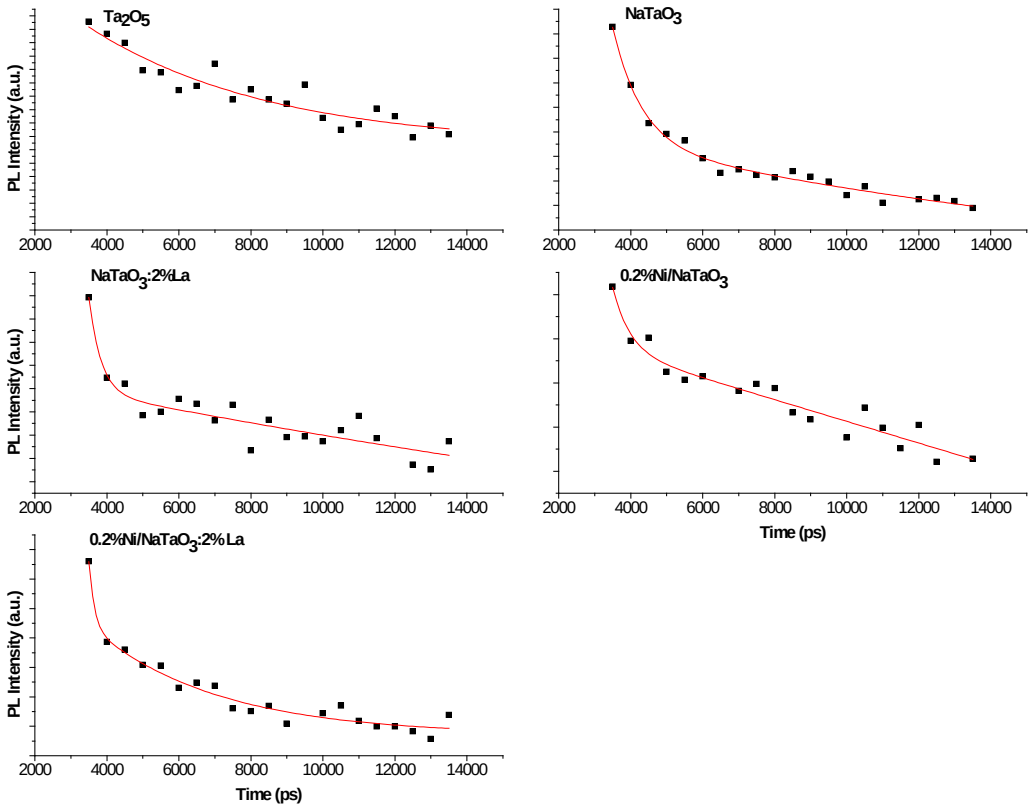

Figure S1. PL emission decay curves for tantalum-based photocatalysts.

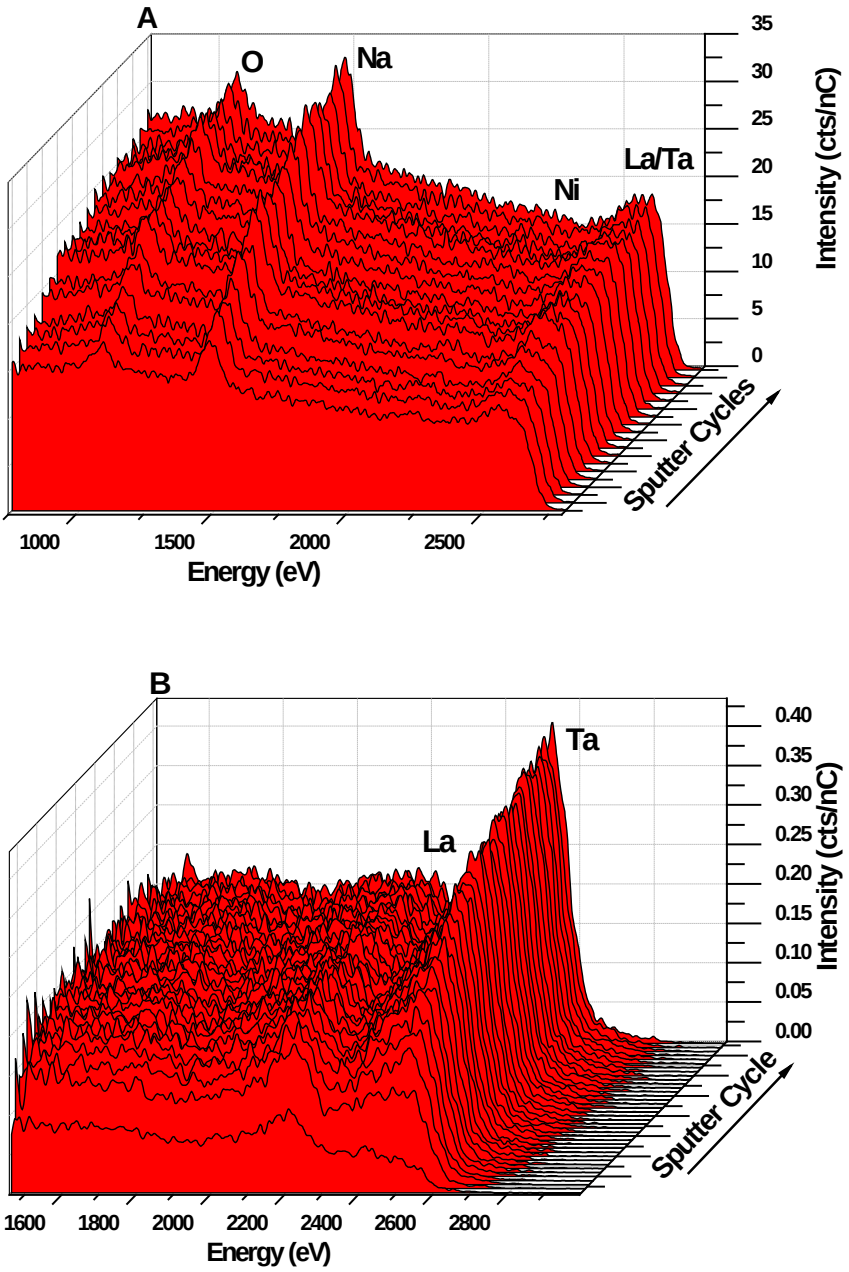

Figure S2. HS-LEIS depth profile for the promoted 0.2%NiO/$NaTaO_3$:2%La photocatalyst using (A) He^+ ion gas and (B) Ne^+ ion gas.

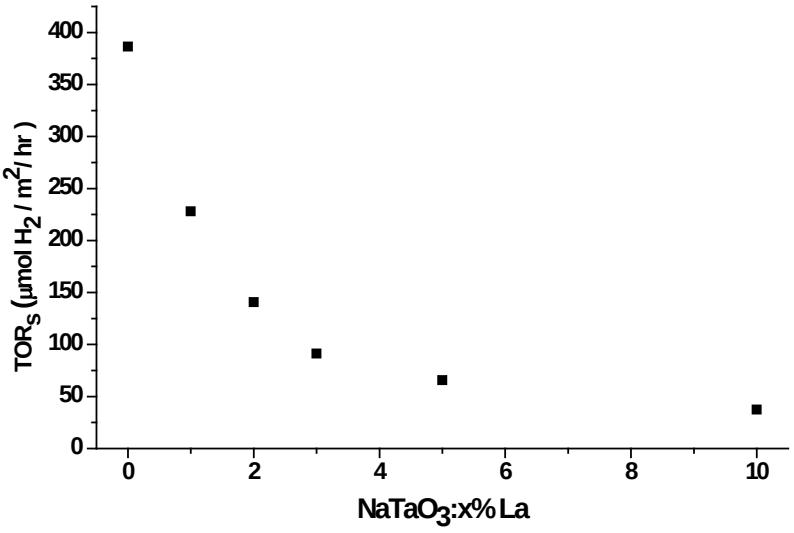

Figure S3. TOR_s (micromoles of H_2 per square meter per hour) as a function of La loading for $NaTaO_3$:La.

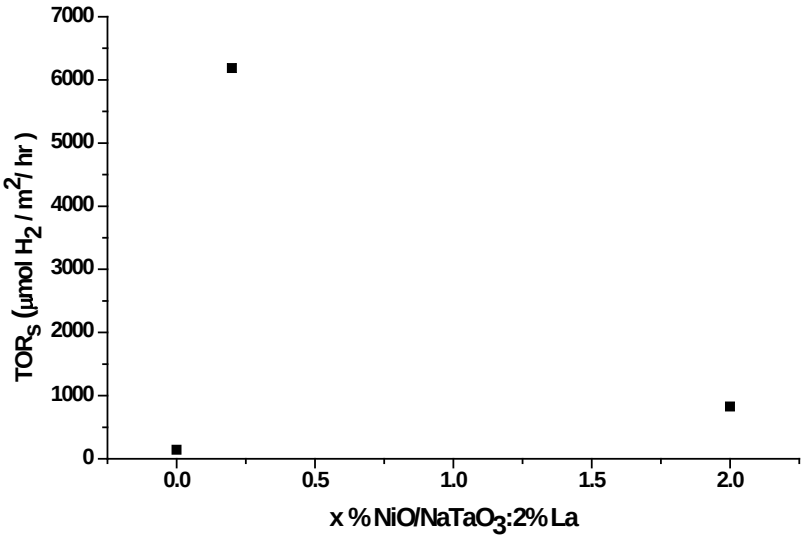

Figure S4. TOR_s (micromoles of H_2 per square meter per hour) as a function of Ni loading for $NaTaO_3$:2%La.

Calculation of N_s for $NaTaO_3$:2%La:

XPS atomic concentration Ta = 13.4 % (1-3 nm)

30% XPS signal from outermost surface layer (Scienta ESCA-300 instrument surface sensitivity)

Ta Outermost surface concentration ≈ 0.3 * 13.4% ≈ 4.02 %

$NaTaO_3$:2%La $\approx 1 \times 10^{15} \frac{atoms}{cm^2}$

$$N_s = .0402 * 1 \times 10^{15} \frac{Ta\ atoms}{cm^2} * \frac{(100cm)^2}{m^2} * 3.2 \frac{m^2}{g} = \frac{1.3 \times 10^{18}\ Ta\ sites}{g\ NaTaO_3: 2\%La}$$

Calculation of N_s for 0.2%NiO/$NaTaO_3$:2%La (similar procedure for 0.05%NiO/$NaTaO_3$)

Ni signal (HS-LEIS) of outermost surface layer estimated at ≈ 25% of total Ni since Ni dispersed both on outermost surface and ~8 layers below the surface.

Mass NiO = 0.002 g

$$N_s = 0.002\ g \frac{1}{74.69 \frac{g\ NiO}{mol\ NiO}} * \frac{6.02 \times 10^{23} molecules\ NiO}{molNiO} * 0.25$$
$$= \frac{4.0 \times 10^{18} NiO\ sites}{g\ 0.2\%NiO/NaTaO_3: 2\%La}$$