Electronic Supplementary Information

Transparent Nb-doped TiO_2 Film with [001] Preferred Orientation for Efficient Photocatalytic Oxidation Performance

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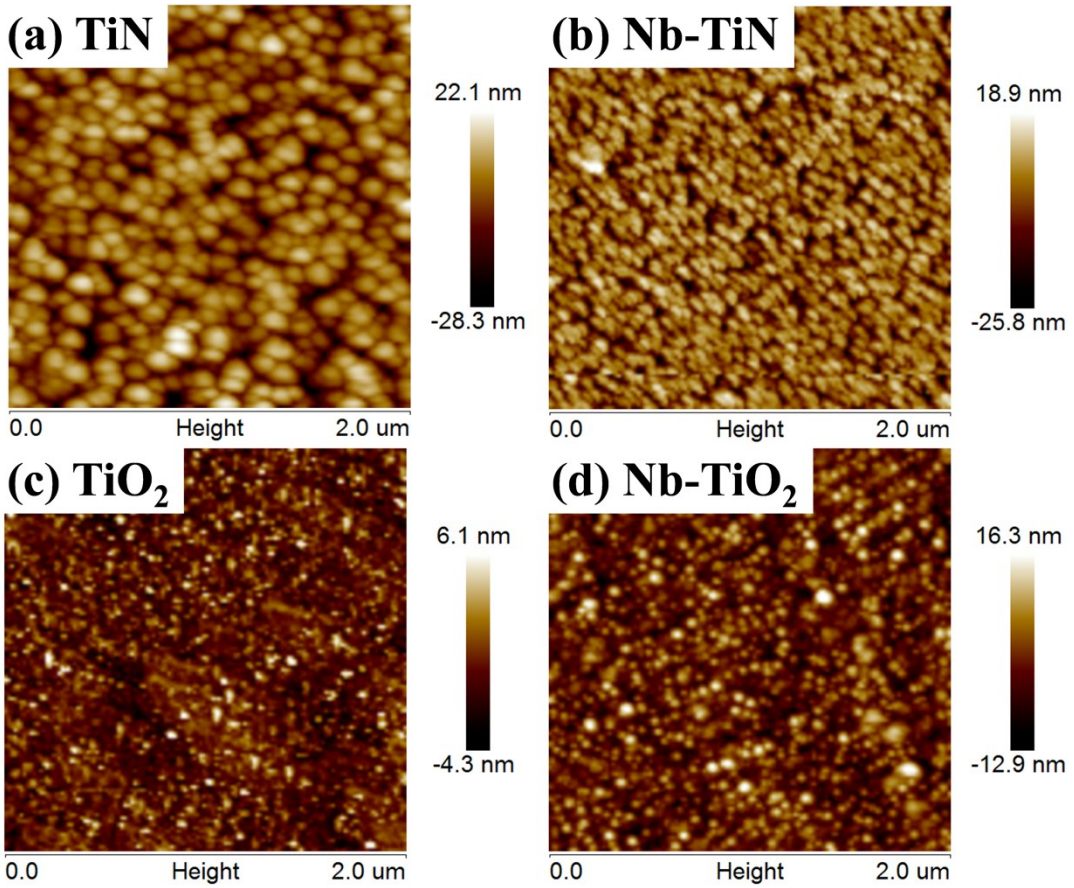

Figure S1. (a)-(d) AFM surface-height topographic maps of the TiN, Nb-TiN, TiO_2-600 ºC, and Nb-TiO_2-600 ºC films.

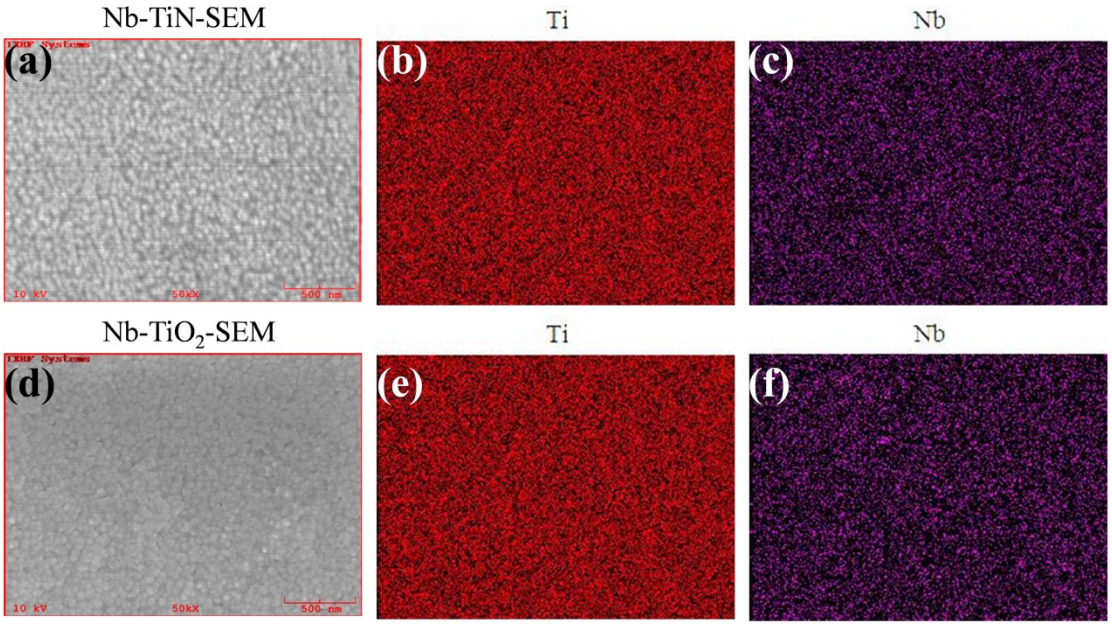

Figure S2. (a) and (d) SEM images of the surface section of the Nb-TiN and Nb-TiO_2-600 ºC films, respectively; (b), (c), (e), and (f) EDS mapping of the Ti and Nb elements in Nb-TiN and Nb-TiO_2-600 ºC films.

Table S1. Quantic measured atomic percentage of niobium relative to the total titanium and niobium contained in the Nb-TiN and Nb-TiO_2 samples detected by SEM-EDS.

Nb/(Ti+Nb)	**Test 1**	**Test 2**	**Test 3**	**Test 4**	**Test 5**	**Average**
Nb-TiN	18.8%	18.1%	18.7%	18.3%	17.8%	18.3%
Nb-TiO_2-400 ºC	18.8%	18.2%	19.0%	19.0%	19.8%	19.0%
Nb-TiO_2-500 ºC	18.5%	18.8%	18.6%	18.6%	18.2%	18.6%
Nb-TiO_2-600 ºC	18.7%	18.3%	18.8%	18.9%	19.0%	18.7%
Nb-TiO_2-800 ºC	18.8%	19.4%	18.9%	18.6%	18.9%	18.9%

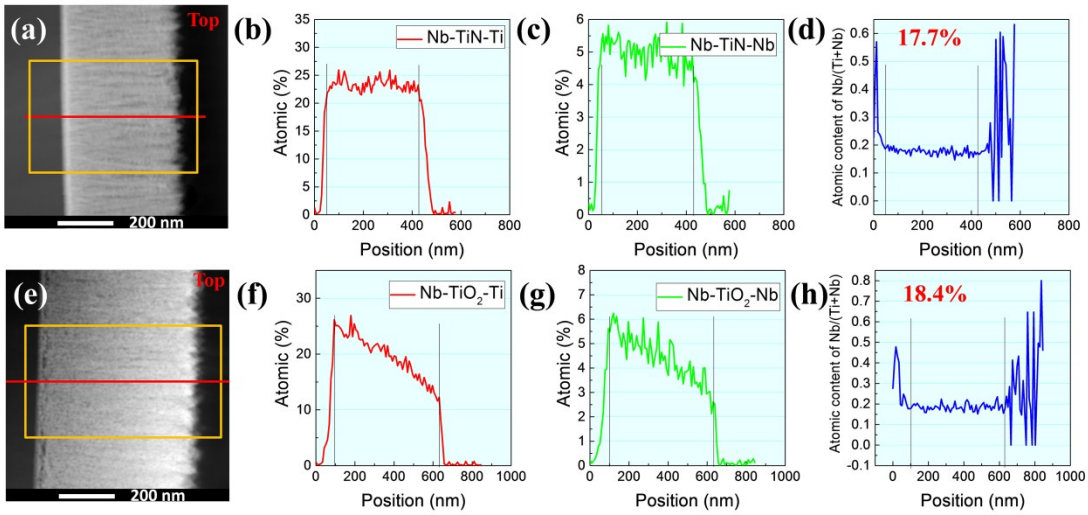

Figure S3. (a) and (e) Cross-sectional TEM images of the Nb-TiN and Nb-TiO_2-600 ºC films, respectively. (b), (c), (f), and (g) TEM-EDS line-scan analysis of the Ti and Nb elemental distribution of the cross-section of the Nb-TiN and Nb-TiO_2-600 ºC films. (d) and (h) Calculated curves of the atomic ratios of Nb/(Ti+Nb) for the Nb-TiN and Nb-TiO_2-600 ºC films, respectively. (The together decrease of the content of the Ti and Nb in (f) and (g) was attributed to the decreased thickness of the film section from the bottom to the top during the cross-sectional TEM sample preparation process.)

A Nb-TiN film without orientation was formed on the quartz substrate using the DC radiofrequency (Rf) sputtering strategy. The DC electricity was set at 0.32 A. The sputtering pressure was centered at 1 Pa with gaseous mixture of Ar and N_2 in a 1:1 ratio. The Nb-TiO_2 film without a [001] preferred orientation was prepared by annealing of the Nb-TiN film without orientation at 600 °C for 2 h under ambient conditions. Finally, the Nb-TiO_2 film was anatase TiO_2 without a preferred orientation and a cross-section of approximately 240 nm.

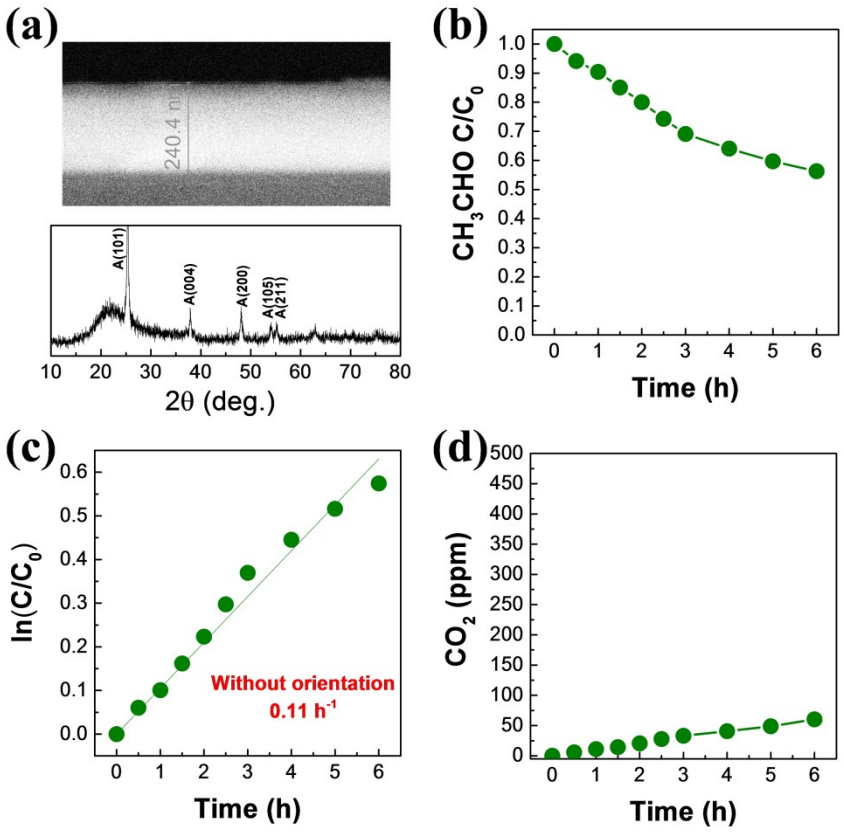

Figure S4. (a) SEM and XRD patterns of the Nb-TiO_2 film without a [001] preferred orientation, (b) photocatalytic degradation curves, (c) degradation kinetic curves, and (d) generation of CO_2 over the Nb-TiO_2 film under simulated sunlight irradiation (350-700 nm).