Electronic Supplementary Material (ESI) for RSC Advances.

Supporting information

Effects of Rh-doping on the Photooxidative Degradation Activity of Titanate Nanosheets

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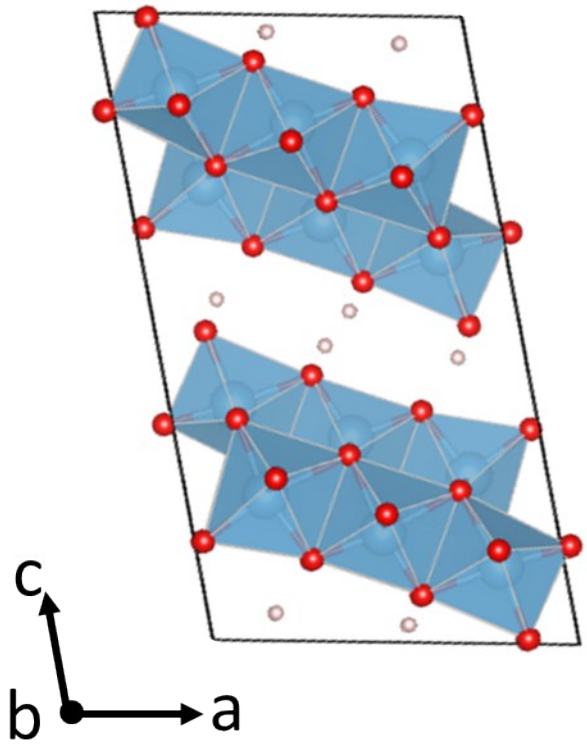


$H_2Ti_3O_7$

a	b	c	α	β	γ
0.918	0.375	1.601	90.000	101.391	90.000
	(nm)			(deg)	

Fig. S1. The schematic of $H_2Ti_3O_7$ crystal shows the monoclinic crystal system which the space group is P2/m.

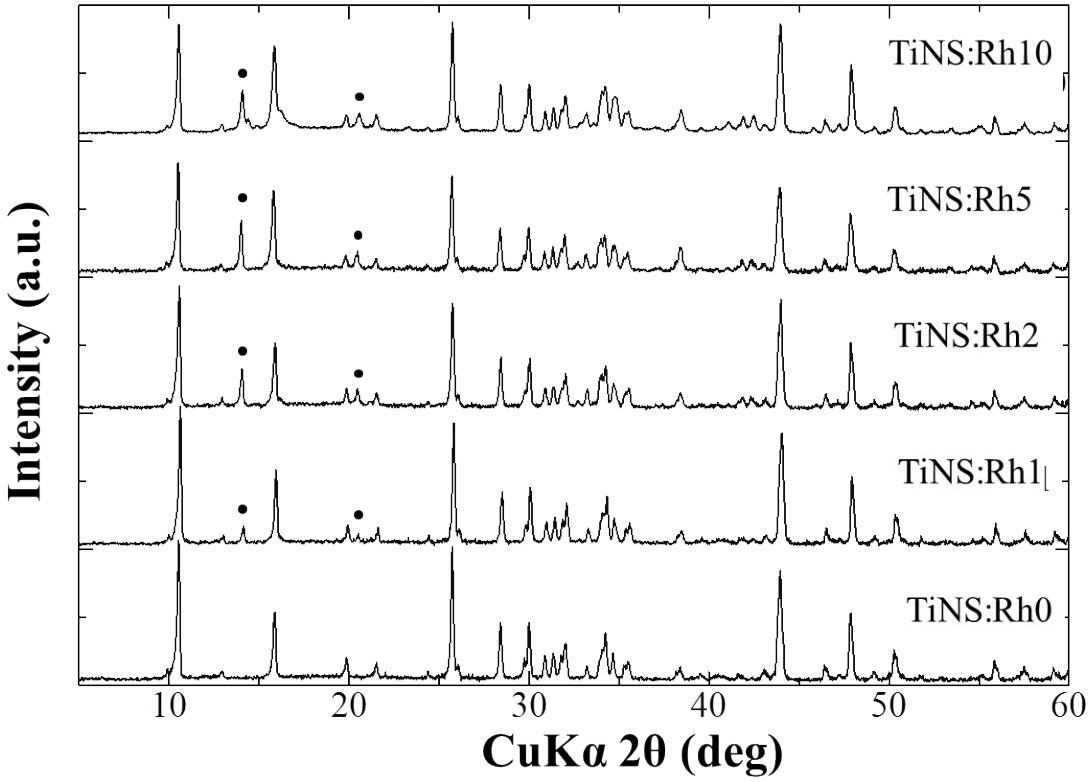
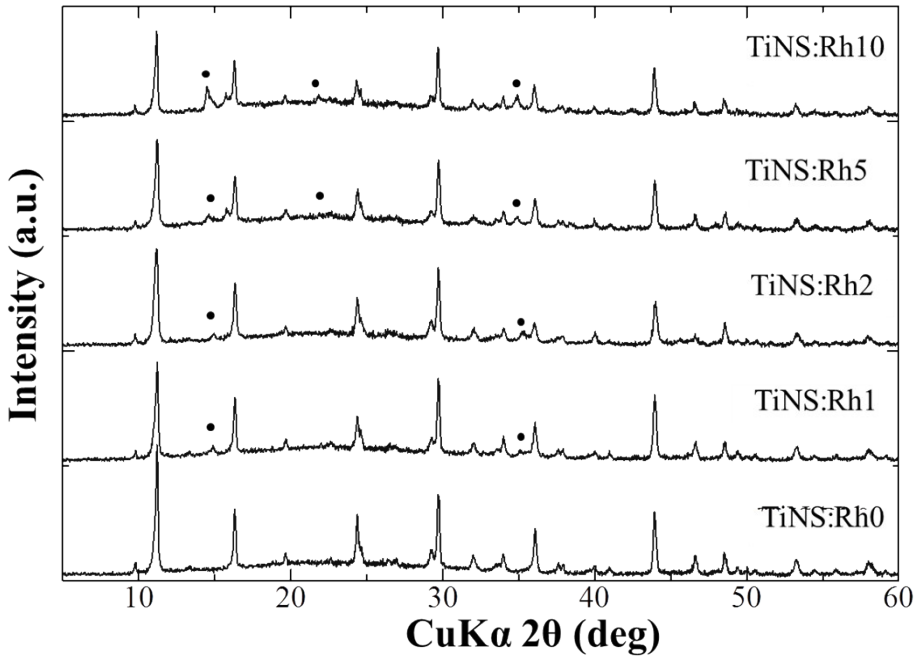
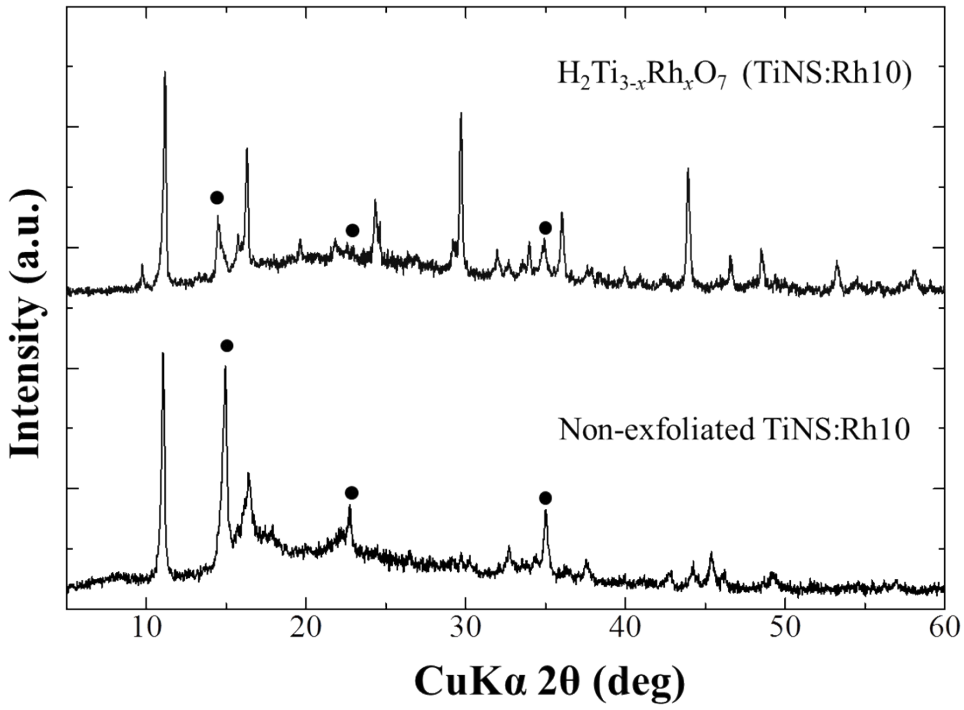


Fig. S2. XRD patterns of synthesized $Na_2Ti_{3-x}Rh_xO_7$, ● is the peak of the unknown.

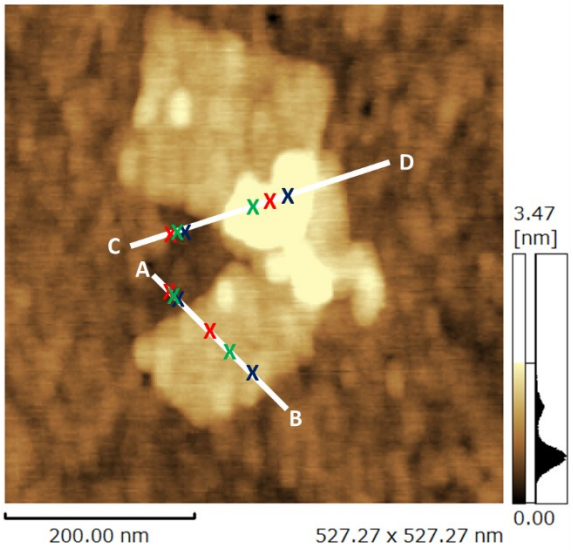


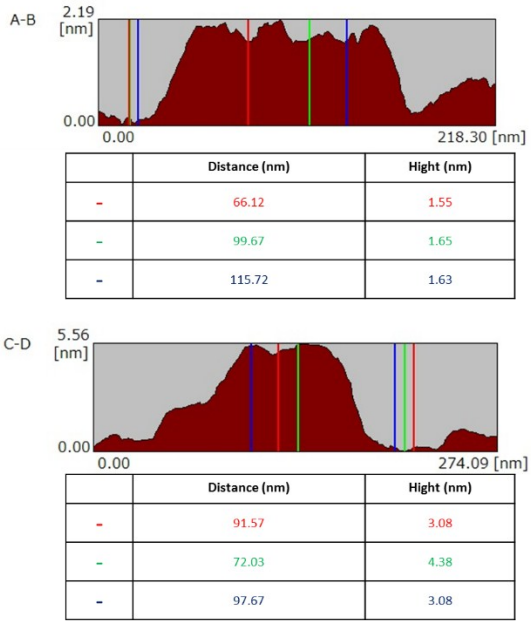
A)



B)

Fig. S3. A) XRD patterns of synthesized $H_2Ti_{3-x}Rh_xO_7$. And, B) The XRD patterns of the non-exfoliated TiNS:Rh10 compared with $H_2Ti_{3-x}Rh_xO_7$ (TiNS:Rh10). ● is the peak of the unknown.





	Distance (nm)	Hight (nm)
-	66.12	1.55
-	99.67	1.65
-	115.72	1.63

	Distance (nm)	Hight (nm)
-	91.57	3.08
-	72.03	4.38
-	97.67	3.08

Fig. S4. shows the AFM image and its cross sectional profiles of TiNS:Rh0 on Si substrate. The sample was prepared by dipping a Si substrate in the TiNS:Rh0 colloidal solution (pH 11) overnight, then washed and dried under vacuum condition. A-B showed the cross section of TiNS 1 sheet. The thickness value of 1 sheet (~1.5-1.6 nm) is 2 times larger than its theoretical value (~0.7 nm), because of TMA+ ion on TiNS surface. C-D showed cross section of overlapped 2 sheets. The thickness value of overlapped 2 sheets is about 2 times larger than 1 sheet.

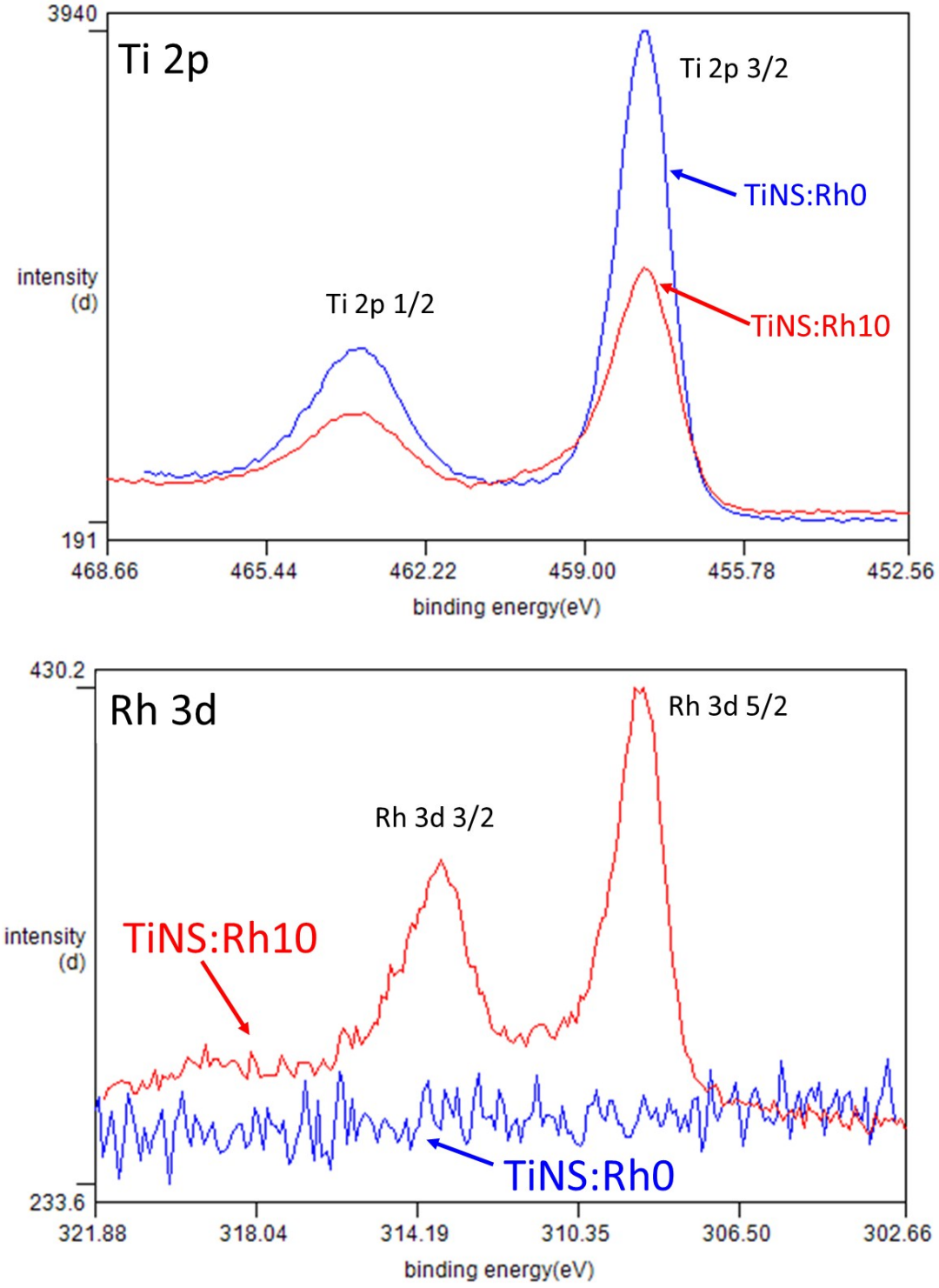


Fig. S5. shows XPS spectra of Ti 2p and Rh 3d for TiNS:Rh0 and TiNS:Rh10. The peak intensity of Ti $2p_{1/2}$ and $2p_{3/2}$ decreased after it was doped, this shows that the Rh replaced in the Ti site.

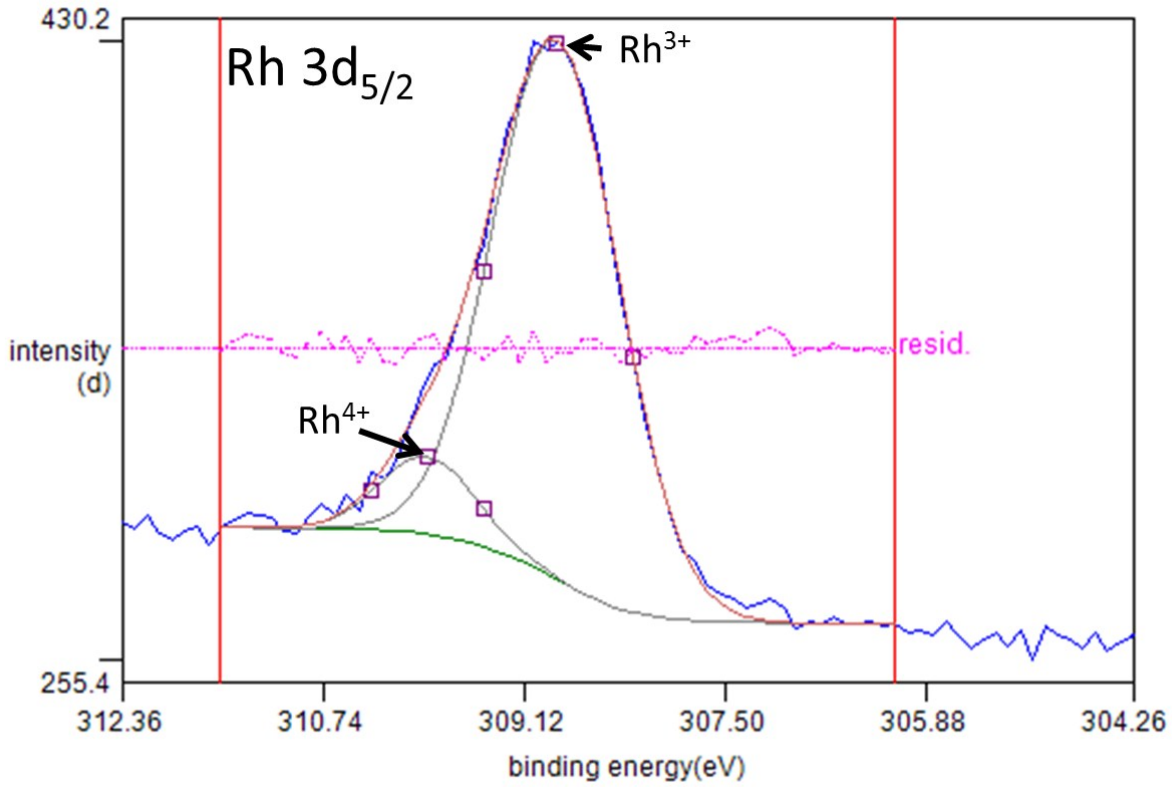


Fig. S6. XPS spectra of Rh 3d5/2, with fit for Rh^{3+} (308.9 eV) and its oxidized state, Rh^{4+} (309.9 eV) according to the several authors reported.[s1-s2] It also has been found that the binding energy of Rh^{3+} is a little bit higher than Rh_2O_3.[s3] This showed that Rh^{3+} and Rh^{4+} were doped in the lattice of TiNS.

References

s1. M. E. E. Grass, Y. Zhang, D. R. Butcher, J. Y. Park, Y. Li, H. Bluhm, K. M. Bratlie, T. Zhang and G. A. Somorjai, *Angew. Chem. Int. Ed.*, 2008, **47**, 8893–8896.

s2. S. M. Kim, K. Qadir, B. Seo, H. Y. Jeong, S. H. Joo, O. Terasaki and J. Y. Park, *Catal. Lett.*, 2013, **143**, 1153–1161.

s3. L. S. Kibis, A. I. Stadnichenko, S. V. Koscheev, V. I. Zaikovskii and A. I. Boronin, *J. Phys. Chem. C*, 2016, **120**, 19142–19150.