Electronic Supplementary Information (ESI)

Catalytic decomposition of N_2O over Rh/Zn-Al_2O_3 catalysts

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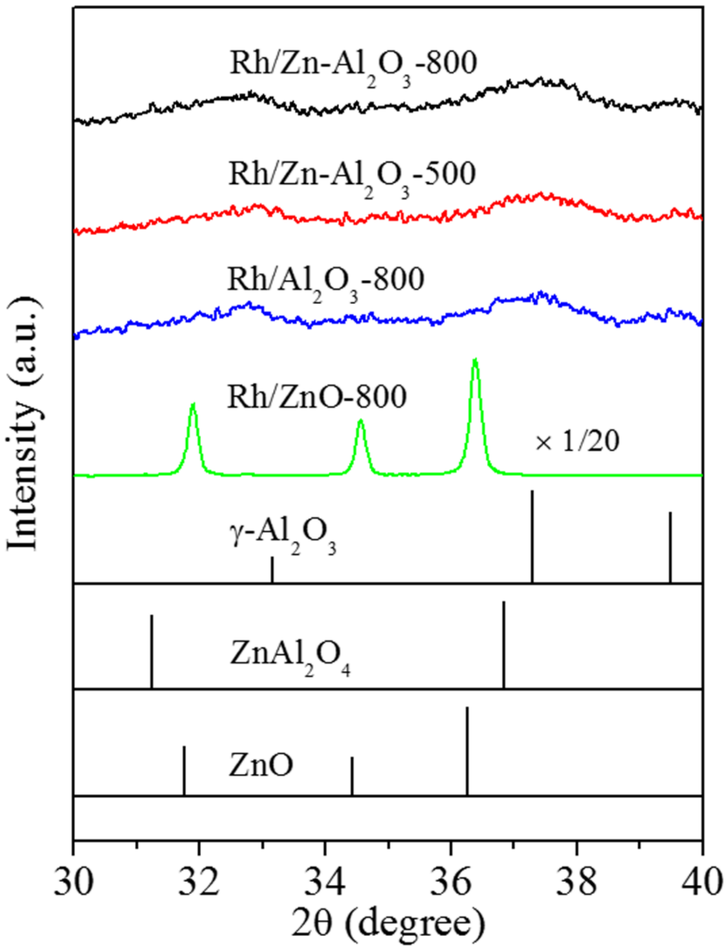


Fig. S1. XRD patterns of the catalysts and standard patterns of γ-Al_2O_3 (PDF#47-1308), $ZnAl_2O_4$ (PDF#05-0699), and ZnO (PDF#36-1451) in the 2θ = 30–40° region.

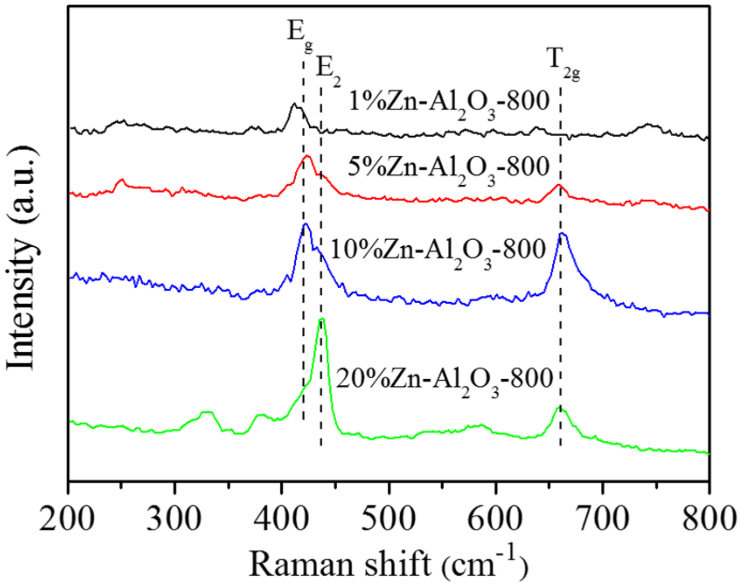


Fig. S2. Raman spectra for Zn-Al_2O_3-800 with different Zn content.

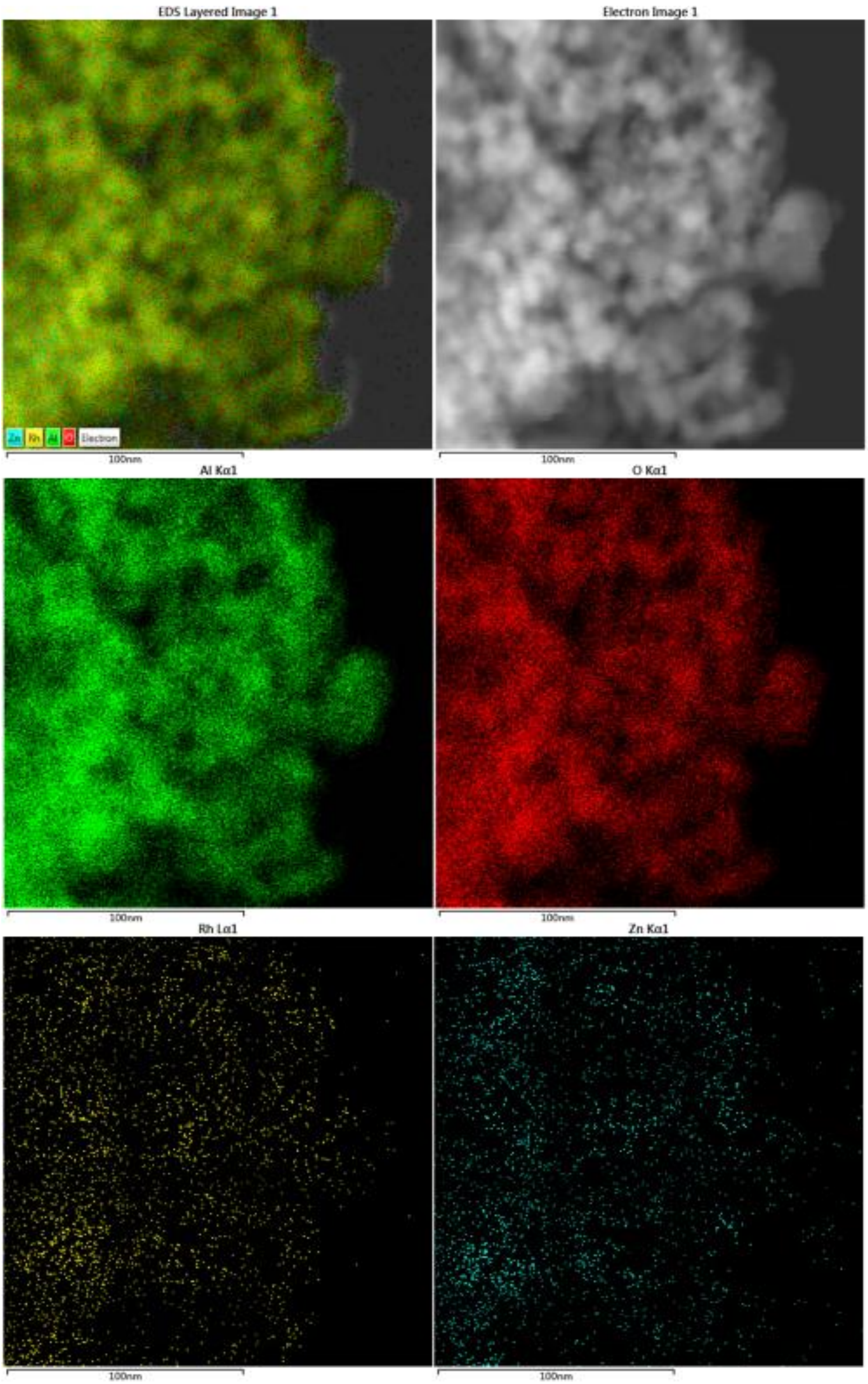
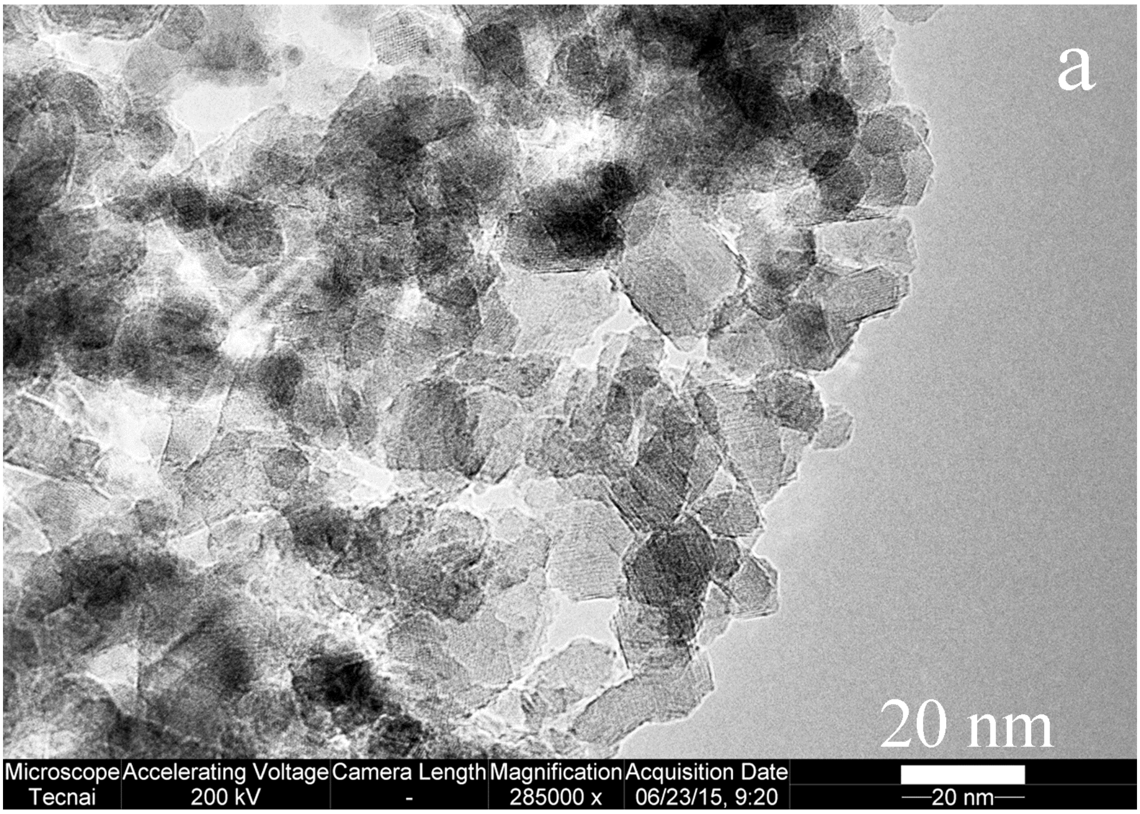


Fig. S3. EDX elemental mapping for Rh/Zn-Al_2O_3-800.


a
20 nm
Microscope
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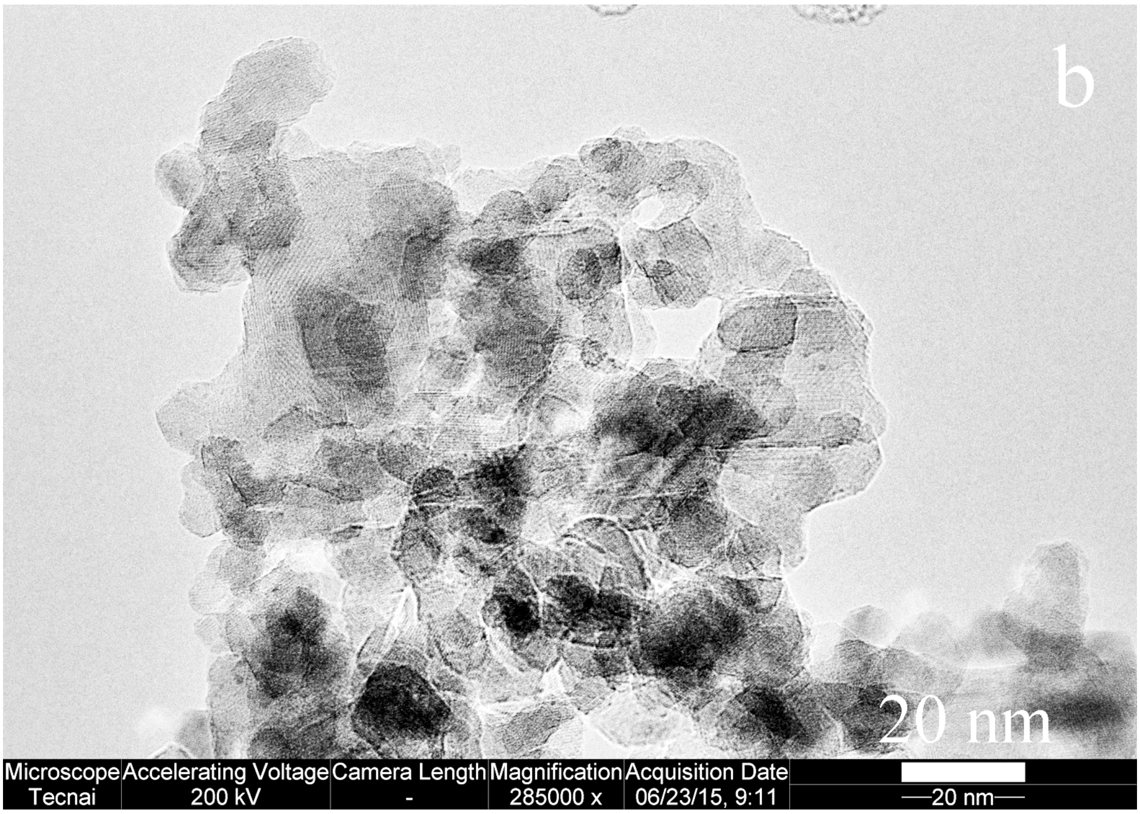
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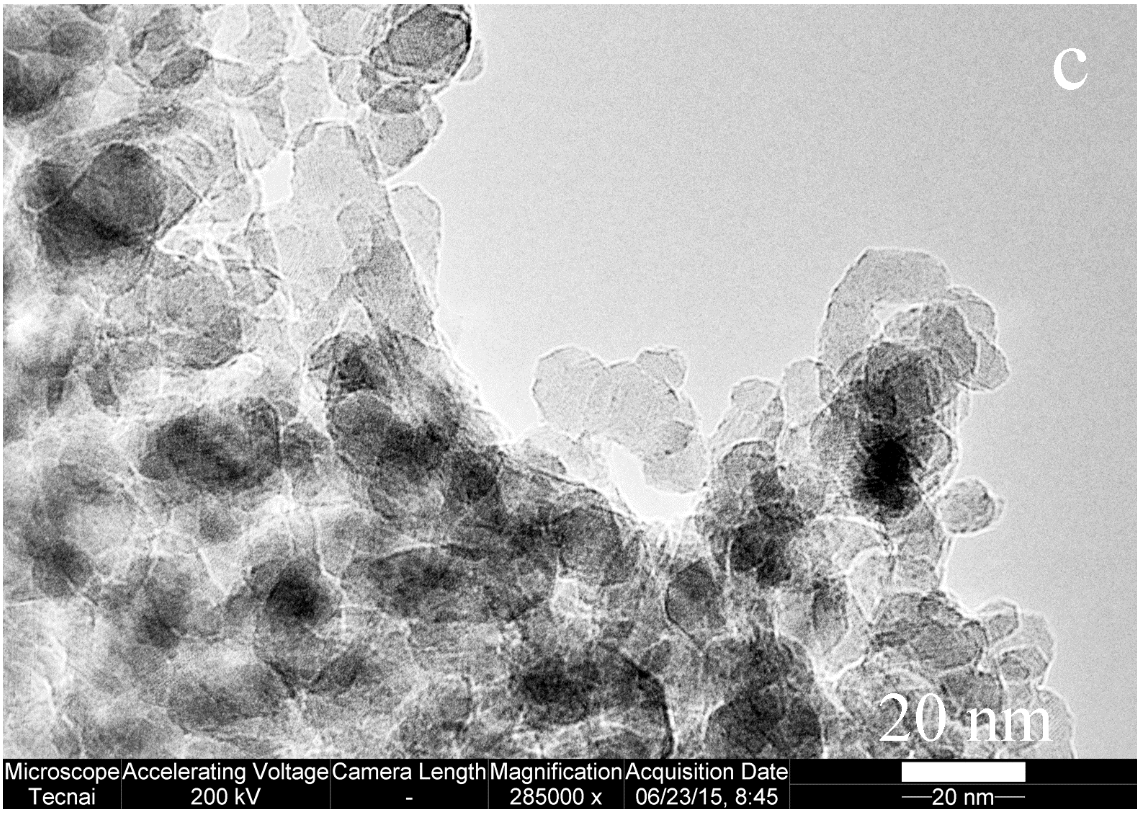

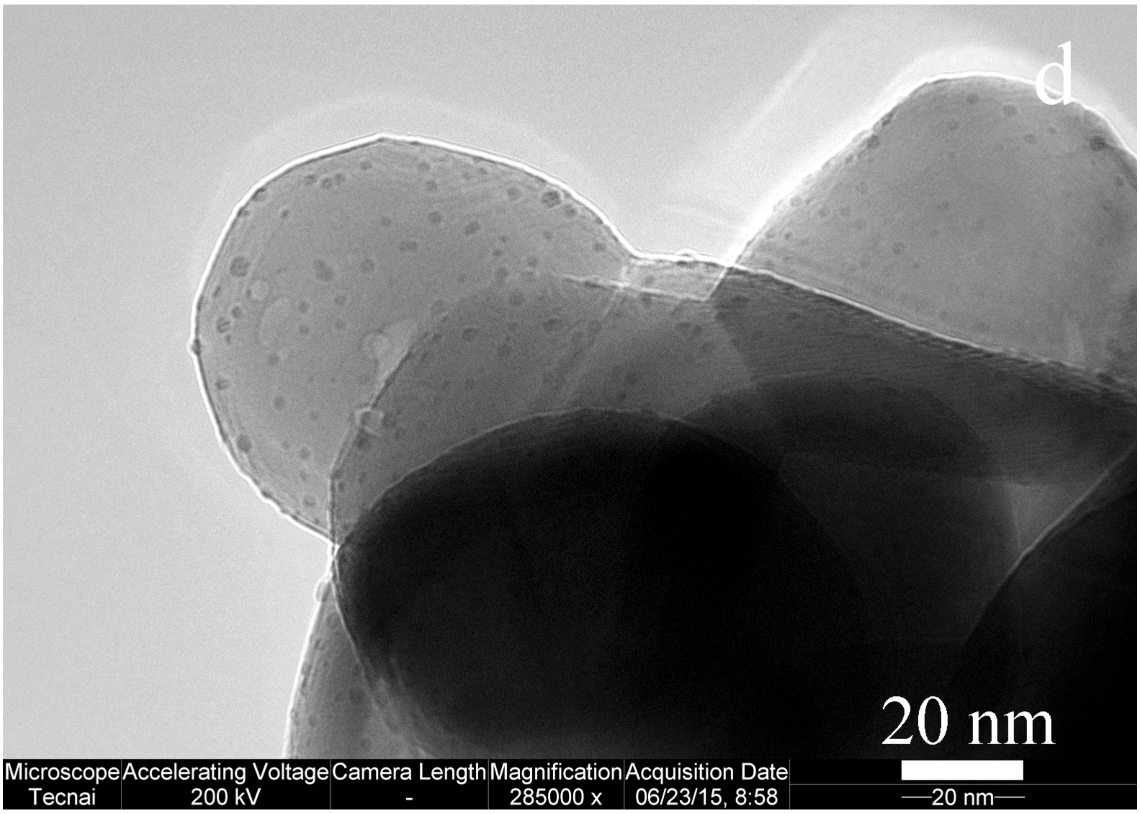

Fig. S4. TEM graphs with larger size for (a) Rh/Zn-Al_2O_3-800, (b) Rh/Zn-Al_2O_3-500, (c) Rh/Al_2O_3-800, and (d) Rh/ZnO-800.

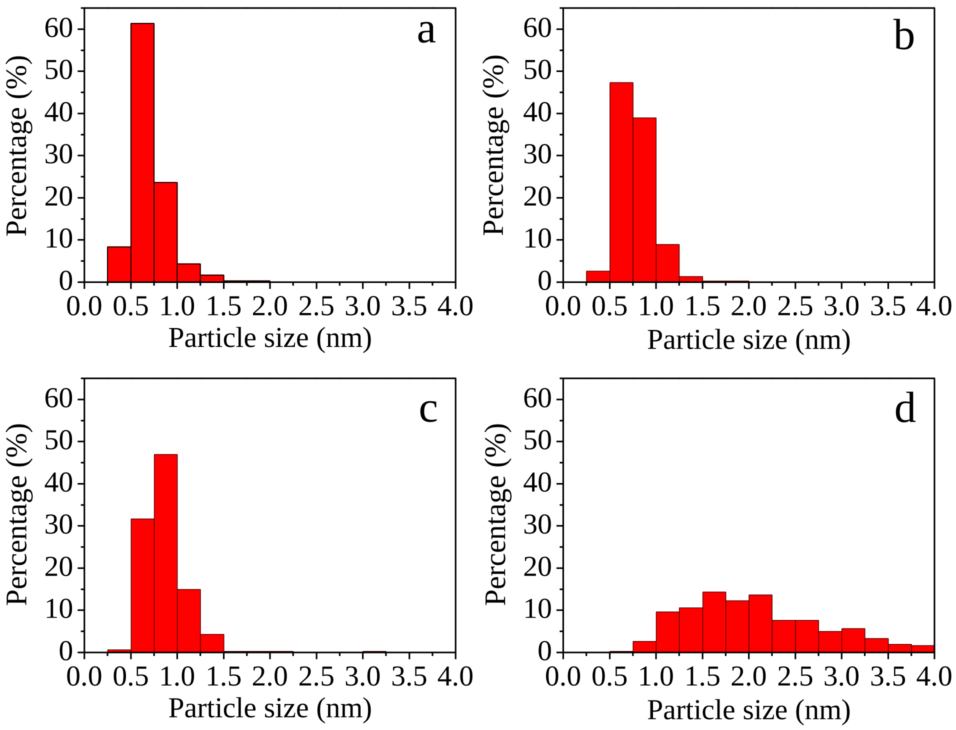

Fig. S5. Distribution of Rh_2O_3 particle sizes for (a) Rh/Zn-Al_2O_3-800, (b) Rh/Zn-Al_2O_3-500, (c) Rh/Al_2O_3-800, and (d) Rh/ZnO-800.

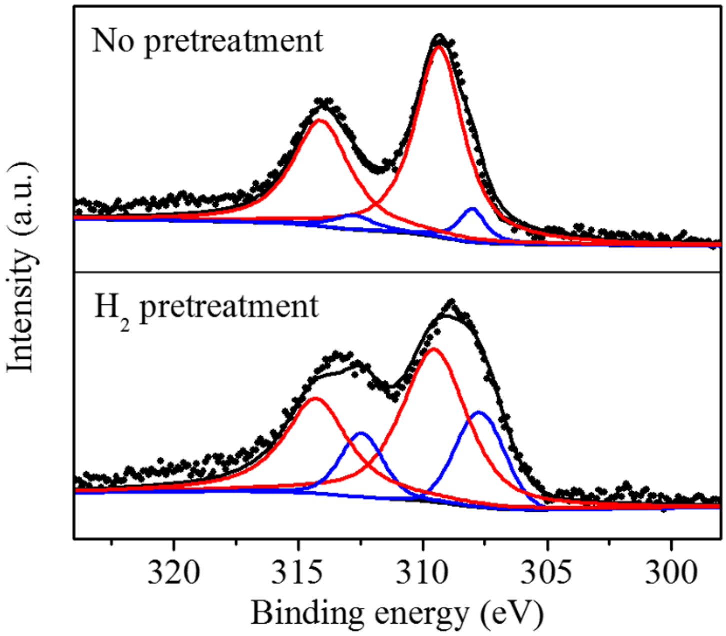

Fig. S6. Rh 3d XPS spectra of Rh/Zn-Al_2O_3-800 without being pretreated or after being pretreated in 4% H_2 (balance He) at 400 ^oC for 2 h.

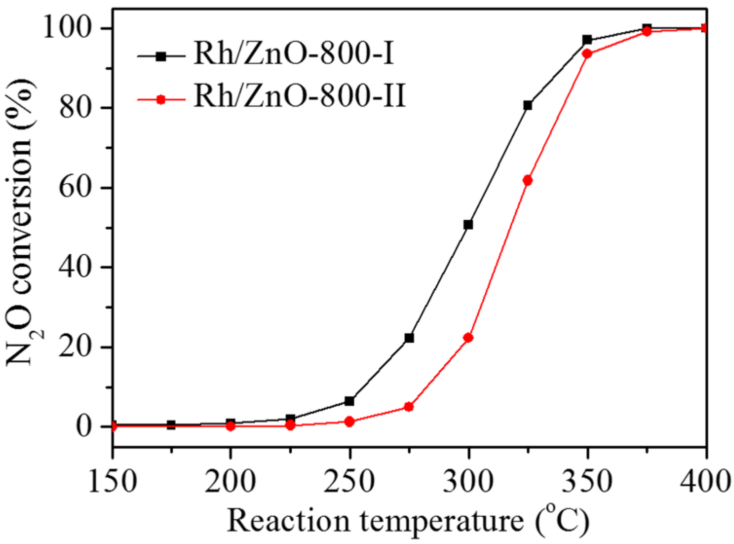

Fig. S7. Conversion of N_2O on Rh/ZnO-800 catalysts prepared using ZnO supports prepared differently. I: ZnO support was prepared by precipitation. II: ZnO support was prepared by calcining $Zn(NO_3)_2•6H_2O$ at 800 °C for 4 h.

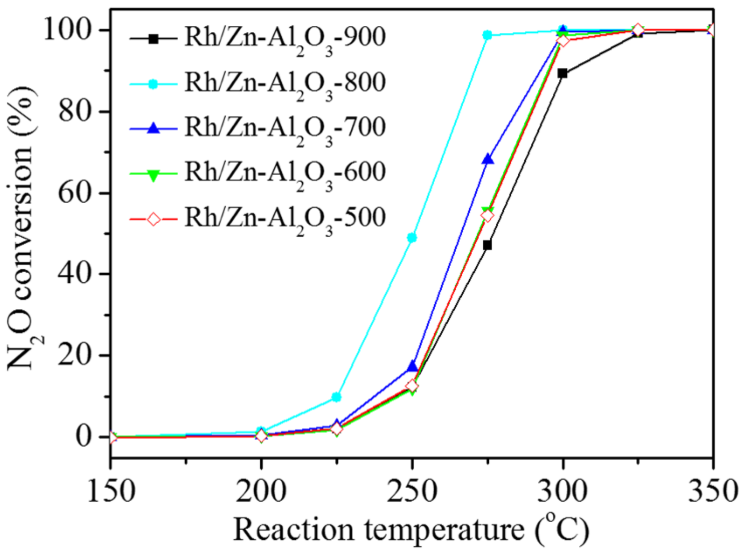

Fig. S8. Conversion of N_2O on Rh/Zn-Al_2O_3 catalysts prepared by using Zn-Al_2O_3 supports calcined at different temperatures. The loading of Zn is 1 wt%.

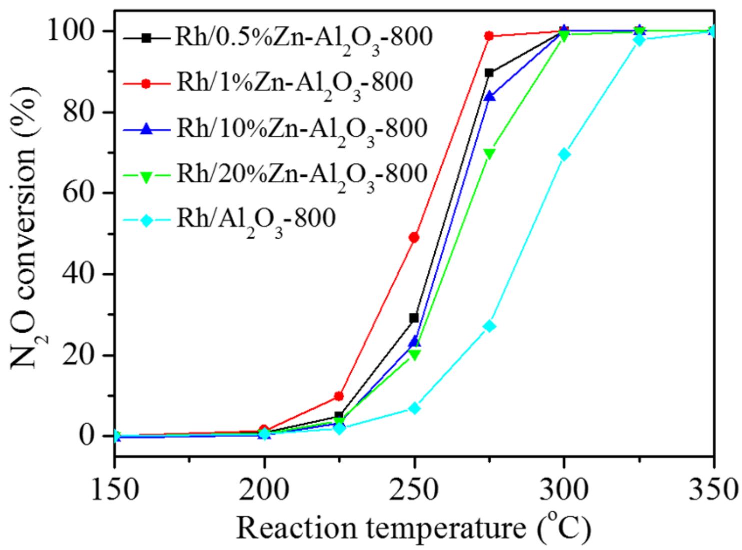

Fig. S9. Conversion of N_2O on Rh/Zn-Al_2O_3-800 catalysts with different Zn loadings.

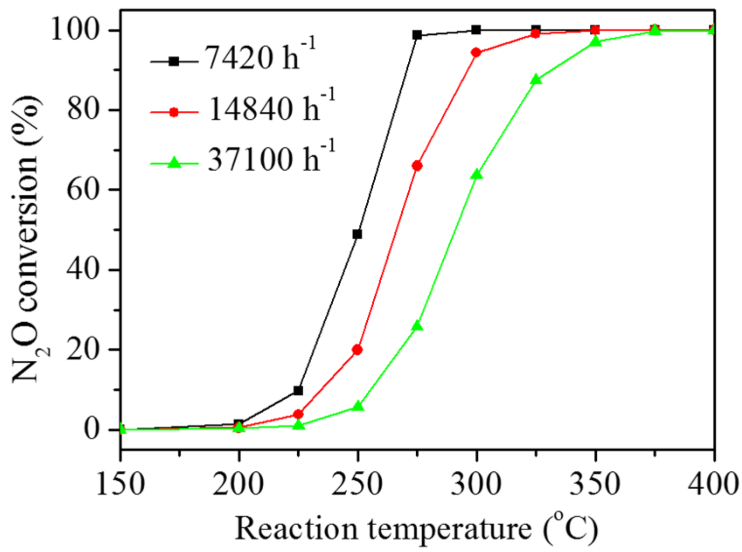

Fig. S10. Conversion of N_2O on Rh/1%Zn-Al_2O_3-800 at different GHSVs.

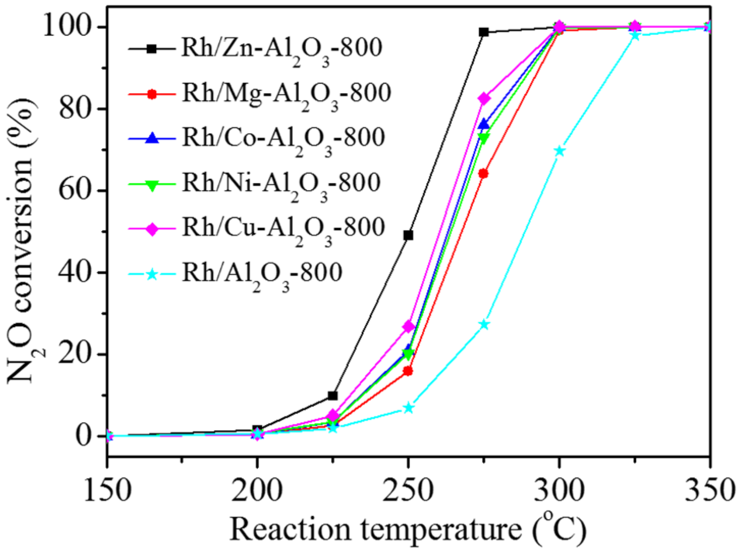

Fig. S11. Conversion of N_2O on different Rh/M-Al_2O_3-800 catalysts as a function of reaction temperature.

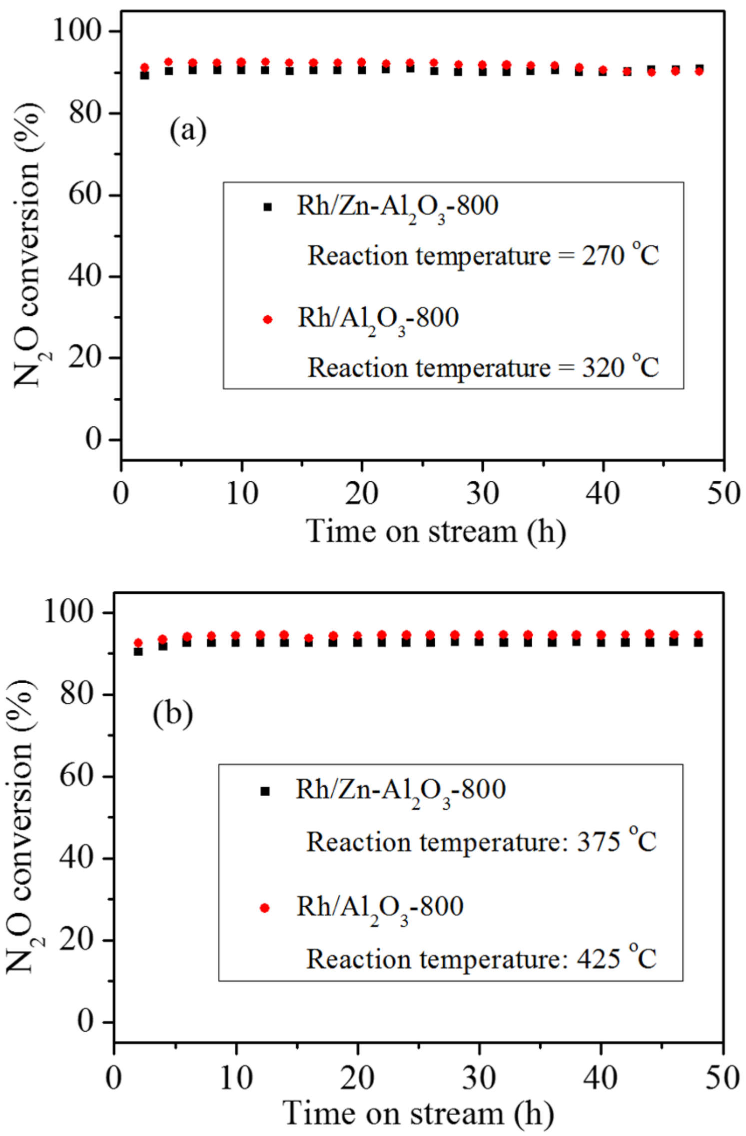

Fig. S12. Conversion of N_2O on Rh/Zn-Al_2O_3-800 and Rh/Al_2O_3-800 as a function of reaction time in the flow of (a) 0.5% N_2O/He and (b) 0.5% N_2O + 2% H_2O + 5% O_2/He.

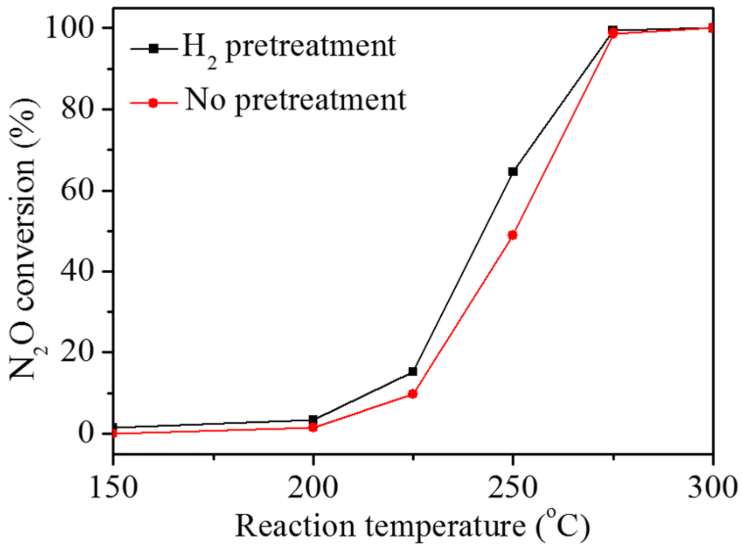

Fig. S13. Conversion of N_2O on Rh/Zn-Al_2O_3-800 catalyst with and without H_2 pretreatment (400 °C for 2 h).

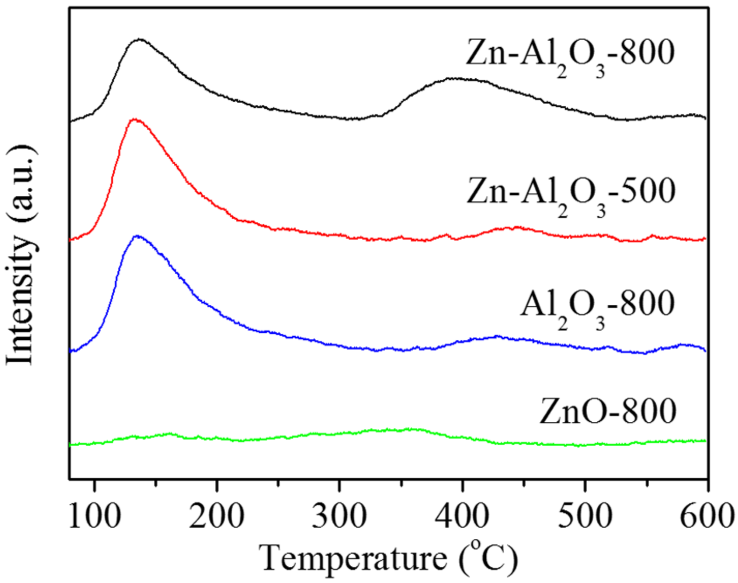

Fig. S14. CO_2-TPD profiles of Zn-Al_2O_3-800, Zn-Al_2O_3-500, Al_2O_3-800, and ZnO-800.

Table S1 Activities of some catalysts for N_2O decomposition in reported literature

Catalyst	Mass of catalyst (g)	Active element content (wt%)	Flow rate ($cm^3 min^{-1}$)	Gas composition	T_{50} (ºC)	T_{90} (ºC)	Reference
Rh/Zn-Al_2O_3-800	0.5	1.1	60	0.5% N_2O	251	271	this work
Rh/Zn-Al_2O_3-800	0.5	1.1	60	0.5%N_2O + 5%O_2 + 2%H_2O	333	371	this work
Rh/Al_2O_3	0.5	1.0	60	0.5% N_2O	289	318	this work
Rh/Al_2O_3	0.5	1.0	60	0.5%N_2O + 5%O_2 + 2%H_2O	388	421	this work
Rh/TiO_2	0.5	1.0	60	0.5% N_2O	310	340	[24]
Rh/SiO_2	0.5	1.0	60	0.5% N_2O	324	360	[24]
Rh/CeO_2	0.5	1.0	60	0.5% N_2O	223	250	[26]
Rh/HAP-PEG-200	0.5	0.97	60	0.5% N_2O	223	245	[26]
Rh/HAP-PEG-200	0.5	0.97	60	0.5%N_2O + 5%O_2 + 2%H_2O	344	386	[26]
Rh/USY	0.05	2.0	50	0.095% N_2O	237	258	[21]
Cu-ZSM-11	0.2	3.06	60	0.5% N_2O	348	373	[46]
Fe-ZSM-11	0.2	3.90	60	0.5% N_2O	435	465	[5]
Co-ZSM-11	0.2	3.59	60	0.5% N_2O	387	435	[51]
Pd/CeO_2	0.1	0.5	100	0.1% N_2O	470	– [a]	[57]
Pt/CeO_2	0.1	0.5	100	0.1% N_2O	462	– [a]	[57]
Ir/CeO_2-Al_2O_3	0.1	0.5	150	0.1% N_2O	474	535	[58]

[a] Conversion did not reach 90% under the reaction condition.