Front. Chem. Sci. Eng.

DOI 10.1007/s11705-017-1659-6

RESEARCH ARTICLE

Rh_2O_3/hexagonal $CePO_4$ nanocatalysts for N_2O decomposition

Huan Liu, Zhen Ma(✉)

Shanghai Key Laboratory of Atmospheric Particle Pollution & Prevention (LAP^3), Department of Environmental Science & Engineering, Fudan University, Shanghai 200433, China

Received February 5, 2017; accepted April 19, 2017
E-mail: zhenma@fudan.edu.cn

Electronic Supplementary Material

Table S1. Comparison of the catalytic performance of various Rh-based catalysts in N_2O decomposition.

Catalyst	Catalyst amount / g	Rh loading / wt%	N_2O concentration / vol.%	Flow rate / mL·min^{-1}	N_2O conversion at 350 °C / %	[a]Specific rate at 350 °C / mmol·g_{Rh}^{-1}·h^{-1}	Ref.
Rh_2O_3/$CePO_4$-nanowires	0.25	1.07	0.5	60	90	270	this work
Rh_2O_3/HAP	0.5	1.00	0.5	60	100	>160	[15]
Rh_2O_3/$LaPO_4$	0.5	2.69	0.5	60	80	47	[8]
Rh_2O_3/γ-Al_2O_3	0.1	0.50	0.1	100	62.5	334	[14]
Rh_2O_3/KIT-6	0.05	1.00	0.17	100	2	18	[37]
Rh_2O_3/mesoporous Al_2O_3	0.25	0.99	0.5	60	100	> 355	[38]
Rh_2O_3/CeO_2	0.05	0.50	0.1	100	100	>1071	[13]

a: Specific rate means the moles of the N_2O converted per gram of Rh per hour. Specific rate = (Flow rate × 60 min × N_2O conversion)/(catalyst amount × Rh loading × 22.4 L/mol).

Table S2. Comparison of the catalytic performance of various Rh-based catalysts in N_2O decomposition.

Catalyst	Catalyst amount / g	Rh loading / wt%	N_2O concentration / vol.%	Flow rate / mL·min^{-1}	N_2O conversion at 275 °C / %	[a]Specific rate at 275 °C / mmol·g_{Rh}^{-1}·h^{-1}	Ref.
Rh_2O_3/$CePO_4$-nanowires	0.25	1.07	0.5	60	90	39	this work
Rh_2O_3/HAP-10.5	0.5	1.00	0.5	60	97	155	[15]

a: Specific rate means the moles of the N_2O converted per gram of Rh per hour. Specific rate = (Flow rate * 60 min * N_2O conversion)/(catalyst amount * Rh loading * 22.4 L/mol).

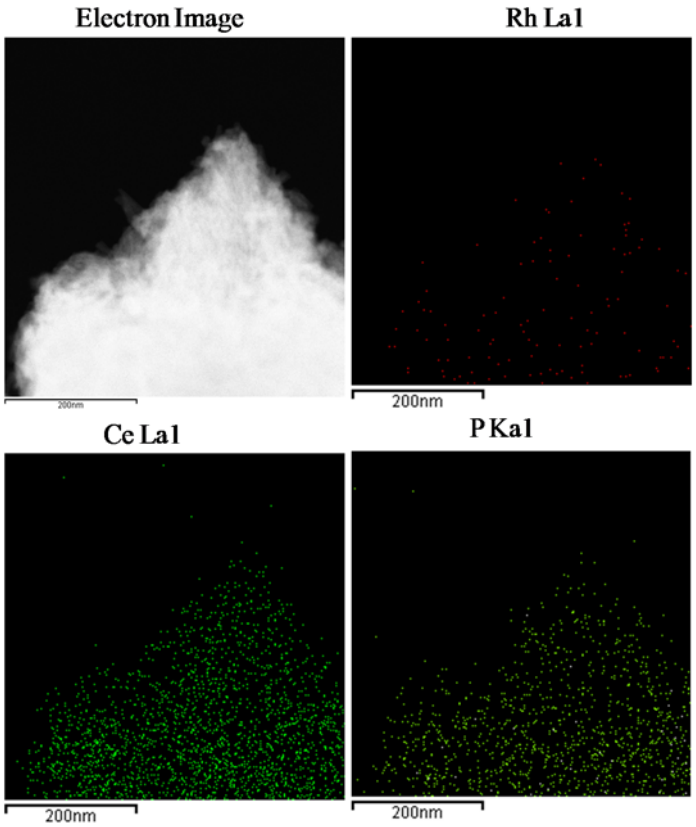

Fig. S1. TEM-mapping images of $Rh_2O_3/CePO_4$-nanorods.

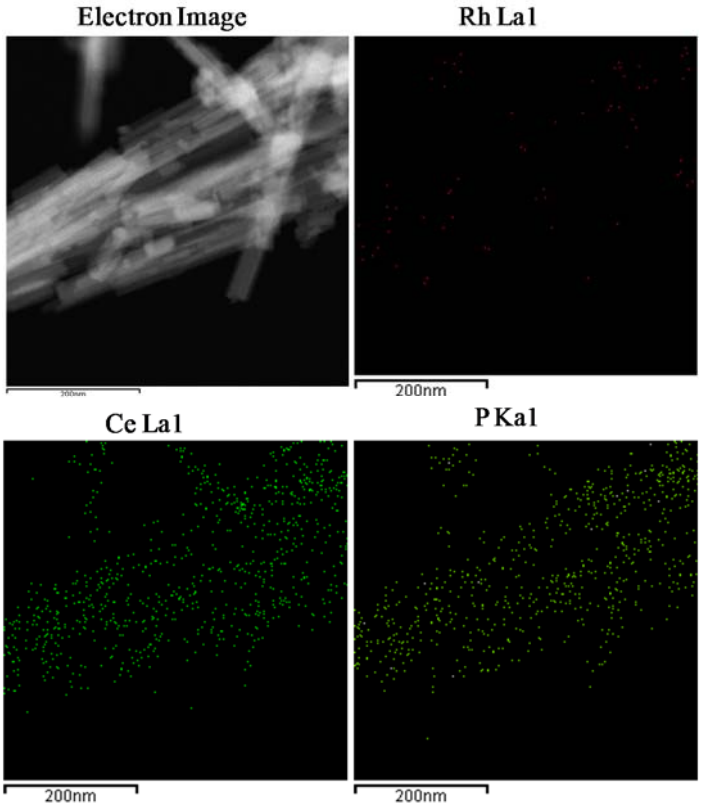

Fig. S2. TEM-mapping images of $Rh_2O_3/CePO_4$-nanowires.

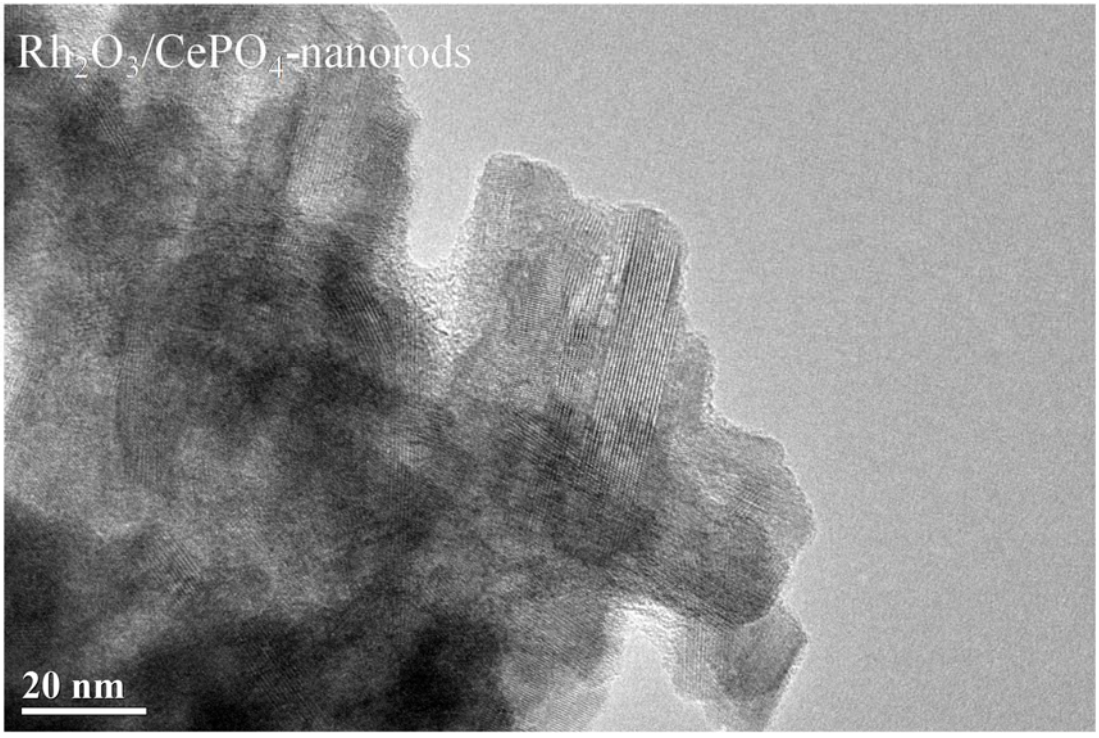

Fig. S3. TEM images of $Rh_2O_3/CePO_4$-nanorods after stability test at 400 ºC.

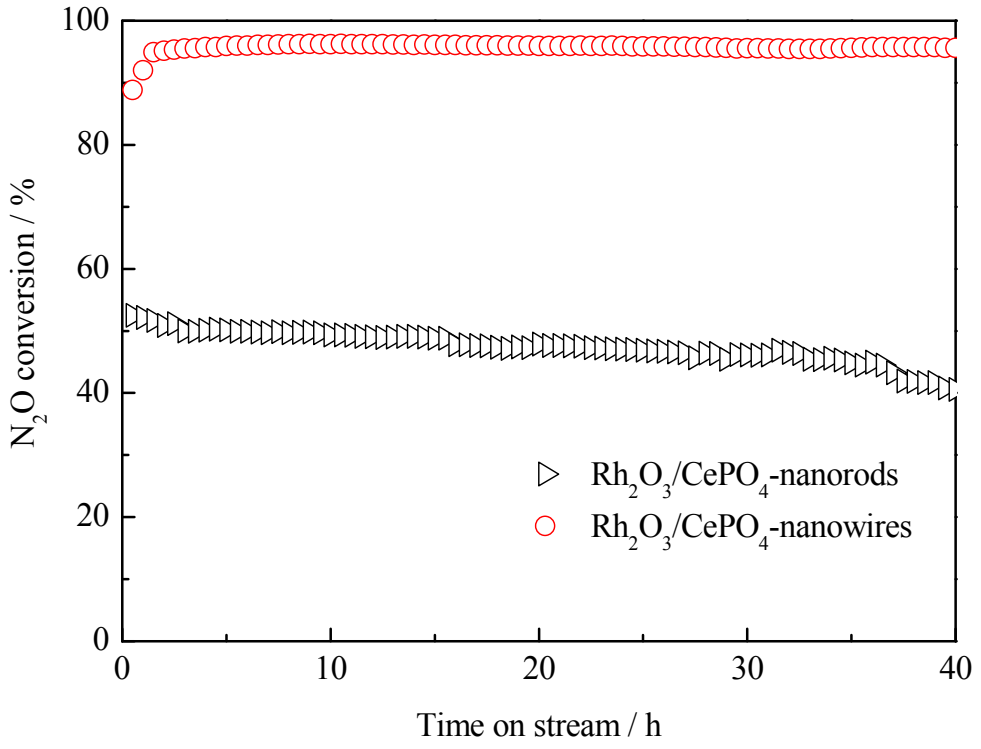

Fig. S4. Data from stability tests in the presence of 5% O_2 and 2% H_2O at 450 ºC.

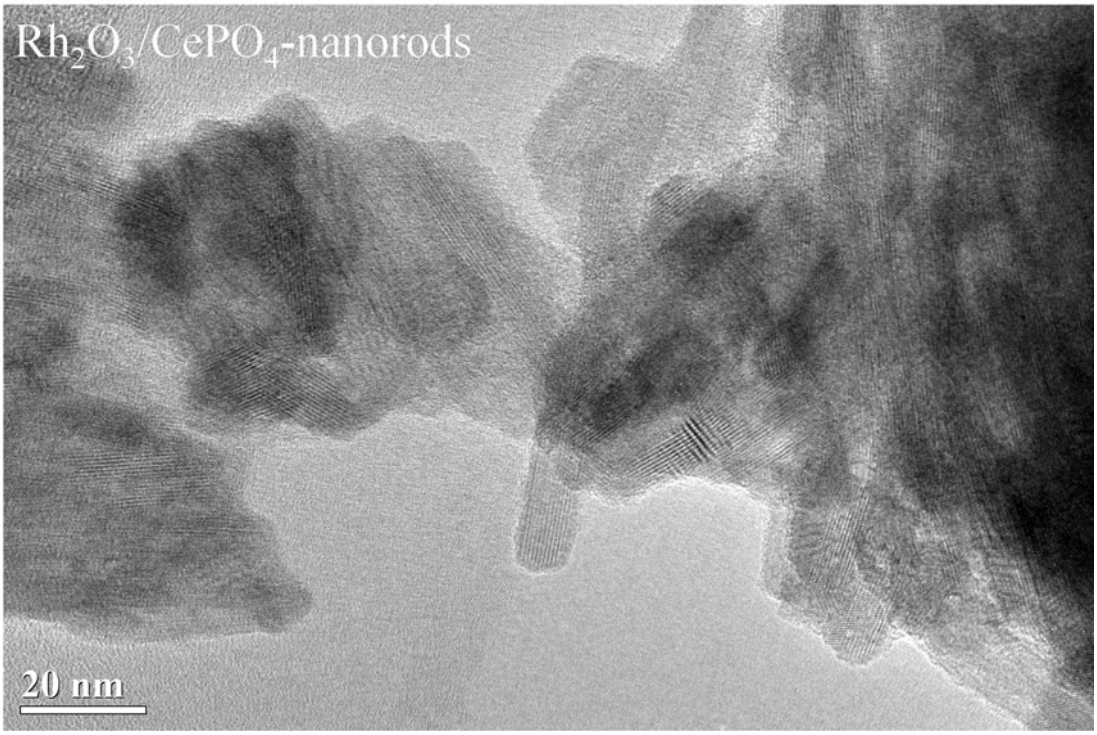

Fig. S5. TEM images of $Rh_2O_3/CePO_4$-nanorods after stability testing in the presence of 5% O_2 and 2% H_2O at 450 ºC.

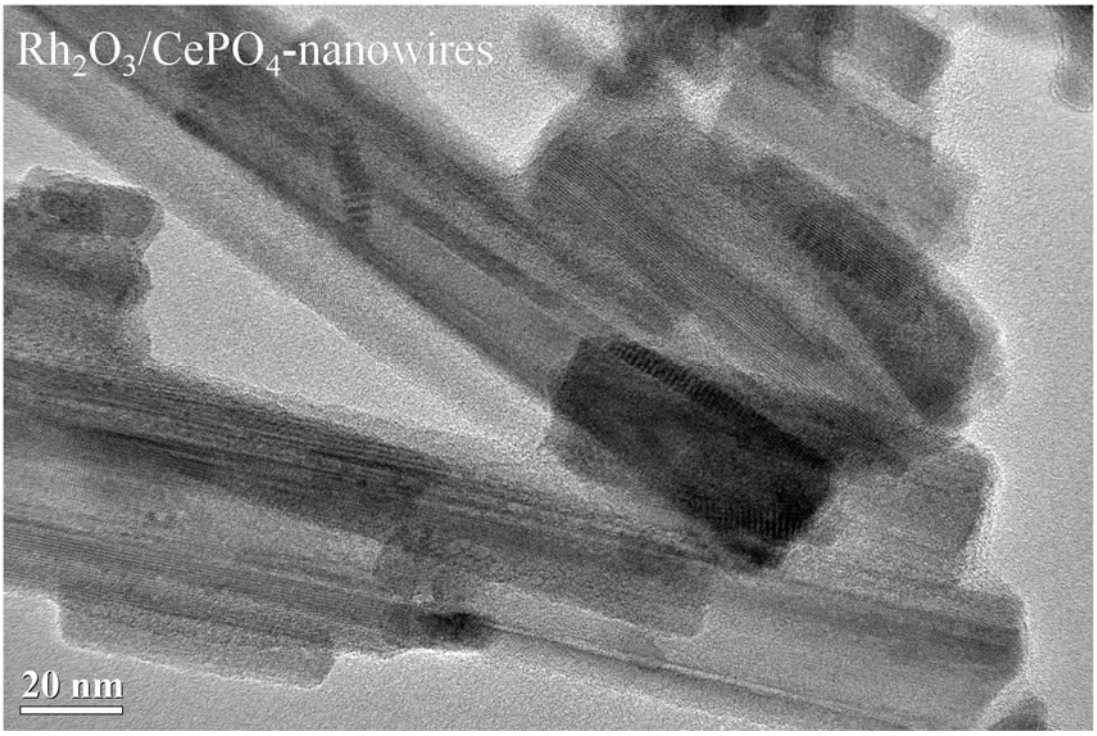

Fig. S6. TEM images of $Rh_2O_3/CePO_4$-nanowires after stability testing in the presence of 5% O_2 and 2% H_2O at 450 ºC.

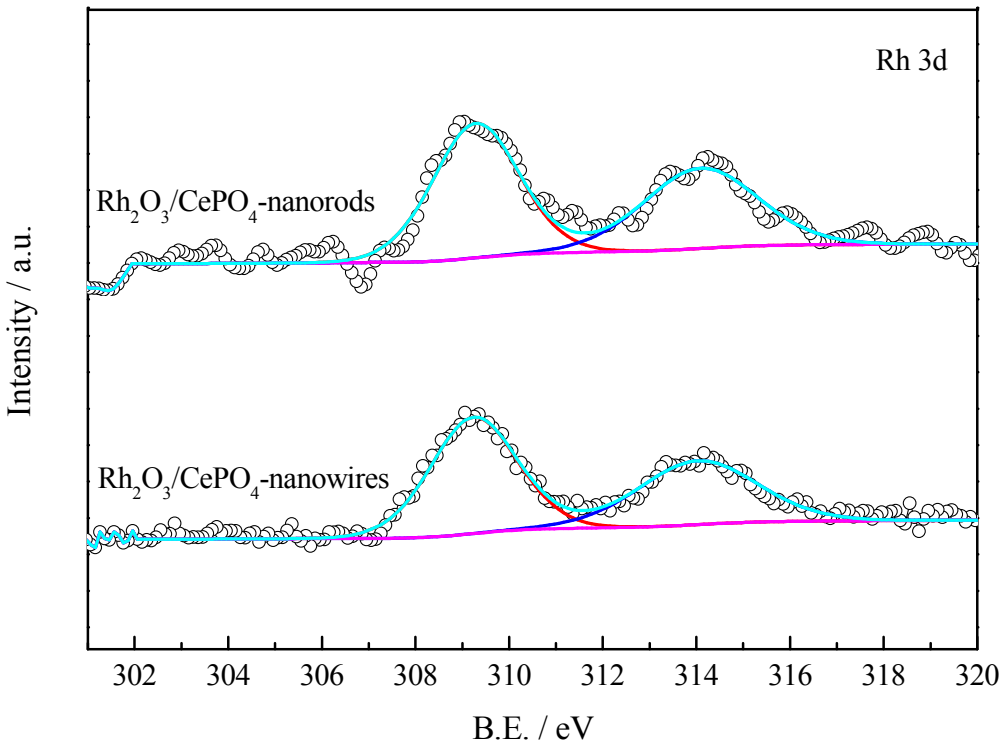

Fig. S7. Rh 3d XPS spectra of $Rh_2O_3/CePO_4$ catalysts.

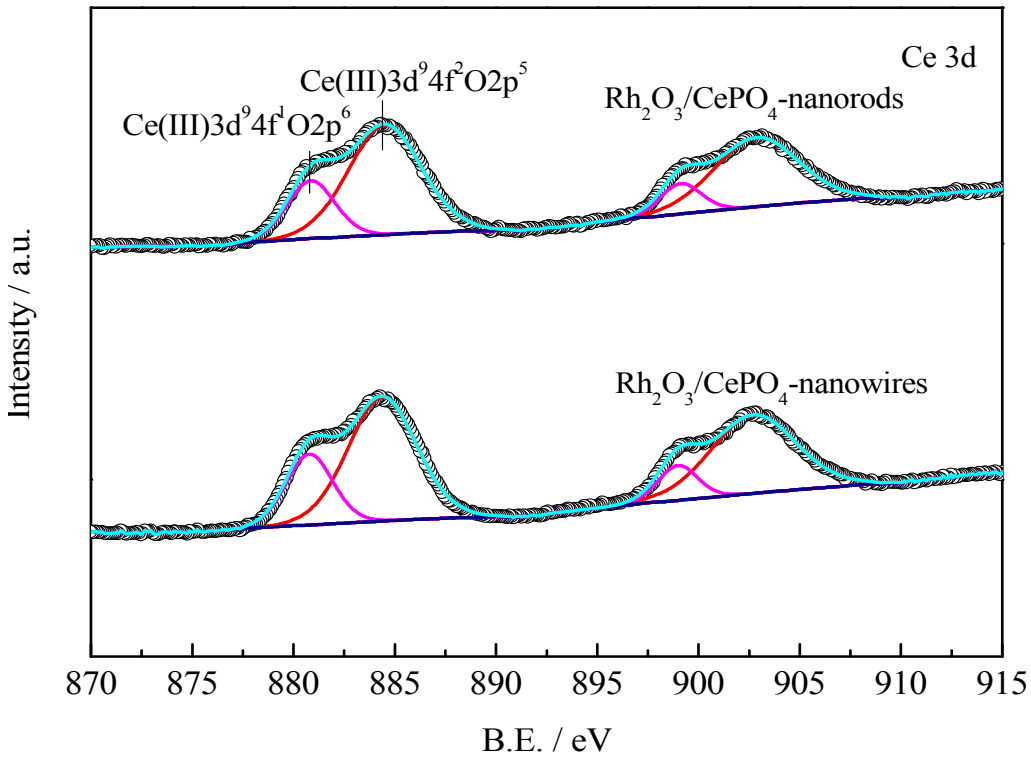

Fig. S8. Ce 3d XPS spectra of $Rh_2O_3/CePO_4$ catalysts.