Investigation of Rh-titanate ($ATiO_3$) interactions on high-surface-area perovskites thin films prepared by atomic layer deposition

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KEYWORDS

CO oxidation; Atomic Layer Deposition (ALD); "Intelligent" catalyst; Rh catalyst; $CaTiO_3$, $SrTiO_3$, $BaTiO_3$, perovskites.

SUPPORTING INFORMATION

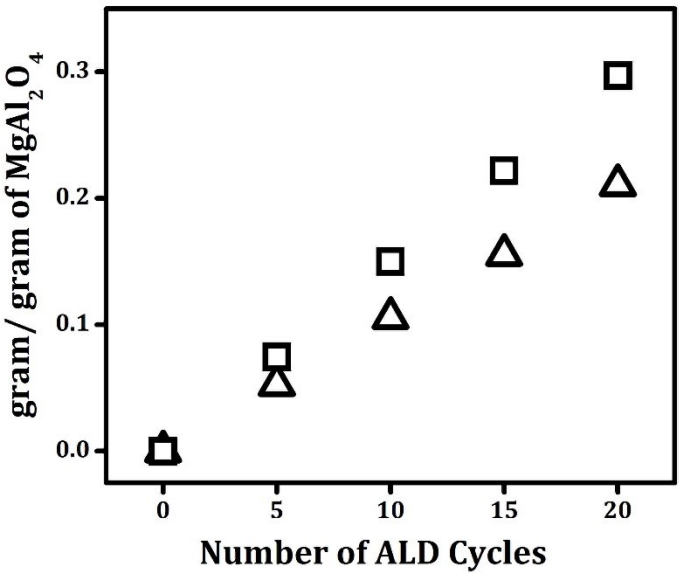

Figure S1. Growth curves for ALD films on a 120m^2/g $MgAl_2O_4$ support for (Δ) Sr-ALD process and (□) Ba-ALD process

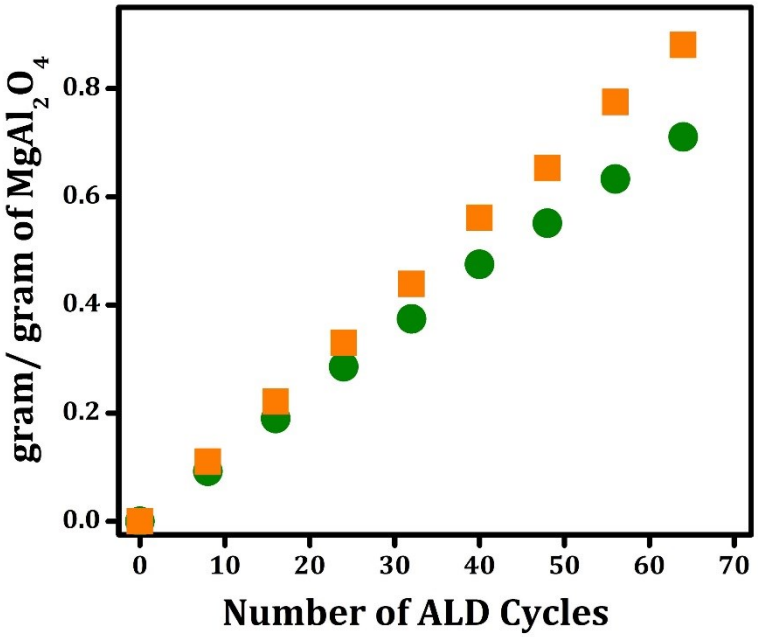

Figure S2. Growth curves for ALD films on a 120m^2/g $MgAl_2O_4$ support for (●) $SrTiO_3/MgAl_2O_4$ and (■) $BaTiO_3/MgAl_2O_4$ process.

Table S2. Results from Rietveld analysis of the XRD patterns of the $CaTiO_3/MgAl_2O_4$ after high temperature redox cycles, in comparison with the cell parameters reported for the parent pure phases.

	$CaTiO_3/MgAl_2O_4$		Parent pure phase
Phase (Space Group)	Amount (wt%)	Cell parameters (nm)	Cell parameters (nm)
$MgAl_2O_4$ ($Fd\bar{3}m$)	76.5%	a = 0.8008	a = 0.8081
$CaTiO_3$ (Pnma)	23.5%	a = 0.5435 b = 0.7662 c = 0.5389	a = 0.5442 b = 0.7640 c = 0.5380

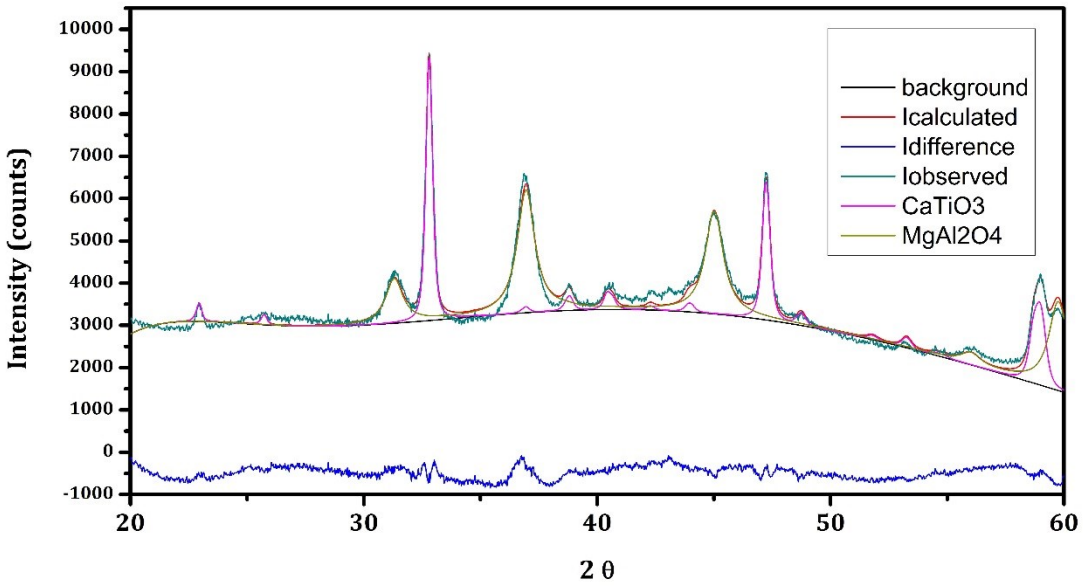

Figure S3. Rietveld refinement for the $CaTiO_3/MgAl_2O_4$ samples.

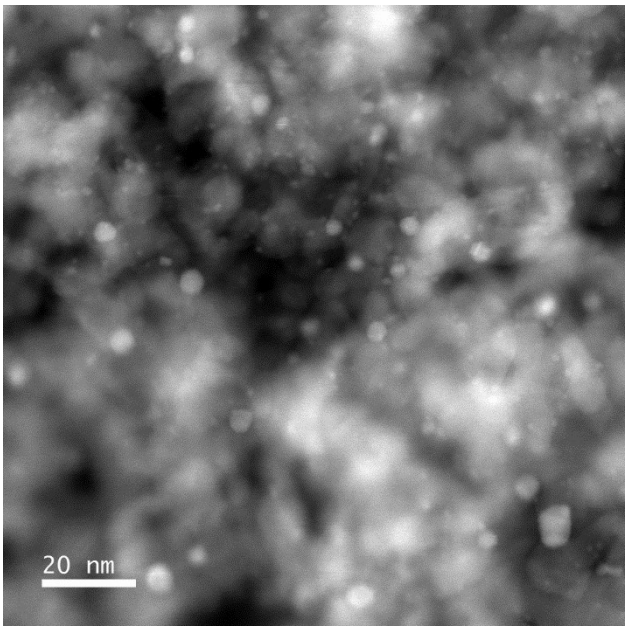

Figure S4. STEM result for $Rh/MgAl_2O_4$, after five 1073-K redox cycles, with the final step being reduction.

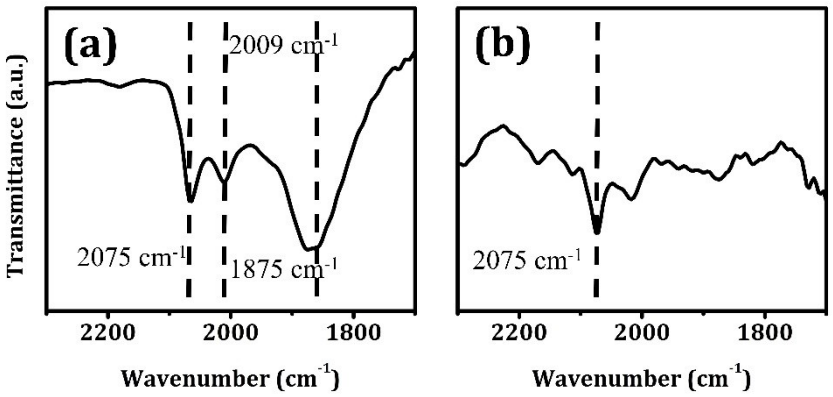

Figure S5. FTIR patterns obtained for (a) $Rh/CaO/MgAl_2O_4$ and (b) $Rh/TiO_2/MgAl_2O_4$ after exposure to CO at room temperature after five 1073 K redox cycles with the final treatment being reduction.

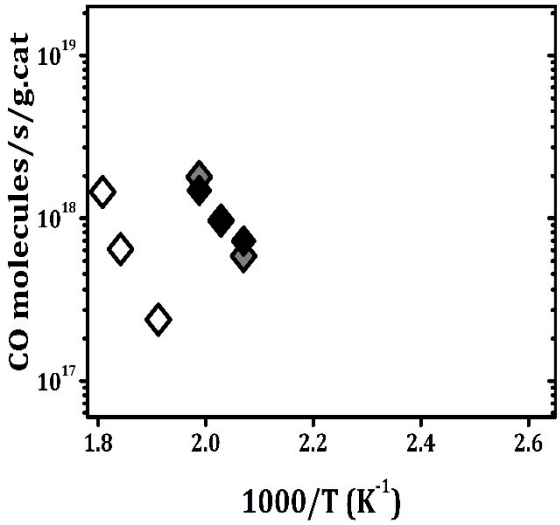

Figure S6. Steady-state, differential reaction rates for CO oxidation with 25 Torr of CO and 12.5 Torr O_2 for $Rh/CaTiO_3/MgAl_2O_4$ with extra Ca (Ca:Ti=1.1) as a function of reduction temperature. Reduction pretreatment temperature: (white) no reduction, (grey) 573 K reduction, and (black) 1073 K reduction.

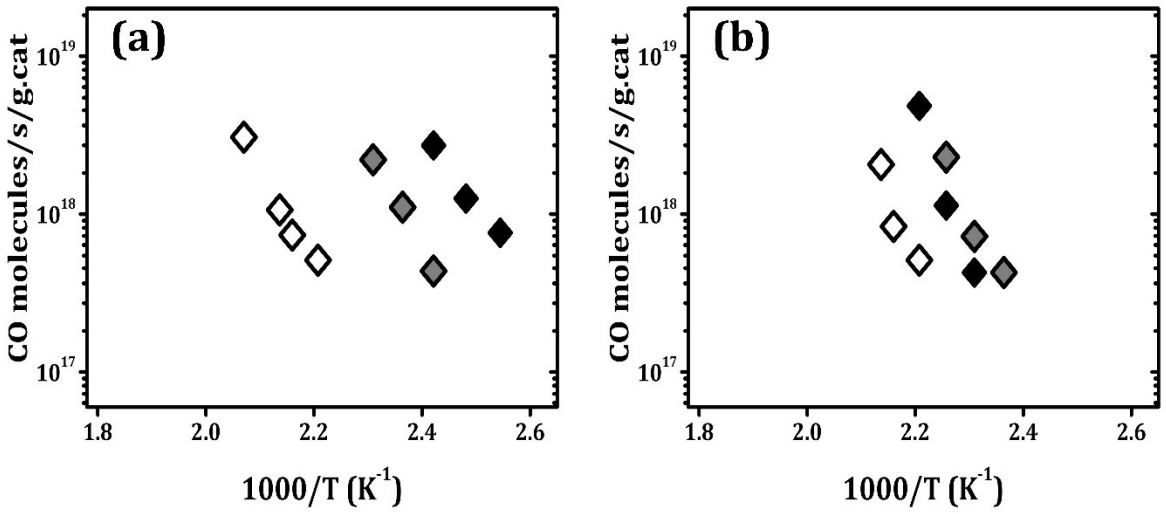

Figure S7. Steady-state, differential reaction rates for CO oxidation with 25 Torr of CO and 12.5 Torr O_2 for (a) $Rh/CaO/MgAl_2O_4$ (b) $Rh/TiO_2/MgAl_2O_4$ as a function of reduction temperature. Reduction pretreatment temperature: (white) no reduction, (grey) 573K reduction and (black) 1073K reduction.

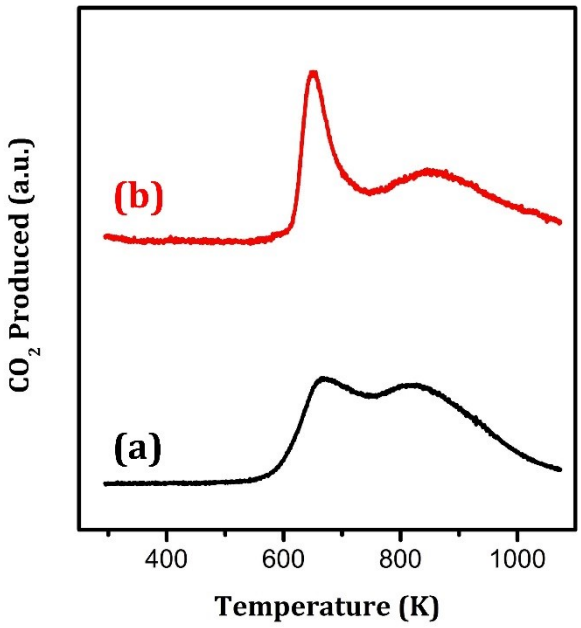

Figure S8. CO-TPR profile for (a)Rh/CaO/$MgAl_2O_4$ and (b)Rh/TiO_2/$MgAl_2O_4$