Supplementary Information (SI) for Journal of Materials Chemistry A.

Urea-Nonstoichiometric Co-modulated $LaMnO_3$ for Ultra-High Gaseous Hg^0 Uptake Across a Broad Temperature Range

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Text S1. Reagents and Materials

All reagents are of analytical grade, purchased from Macklin and Aladdin Reagent Malls (Shanghai, China). Lanthanum nitrate hexahydrate ($La(NO_3)_3{\cdot}6H_2O$, 99%), manganese nitrate solution ($Mn(NO_3)_2$, 50 wt.%) citric acid ($C_6H_8O_7{\cdot}H_2O$, 99.5%) and urea (CH_4N_2O, 99%) are used for the perovskite synthesis. 0.5 mol/L stannous chloride ($SnCl_2$, 99%) was utilized to confirm whether Hg^{2+} was existed in tail gas. 4 wt% potassium permanganate ($KMnO_4$, 99%) and 10% v/v sulfuric acid (H_2SO_4, 95-98%) were used to capture the Hg^0 in tail gas.

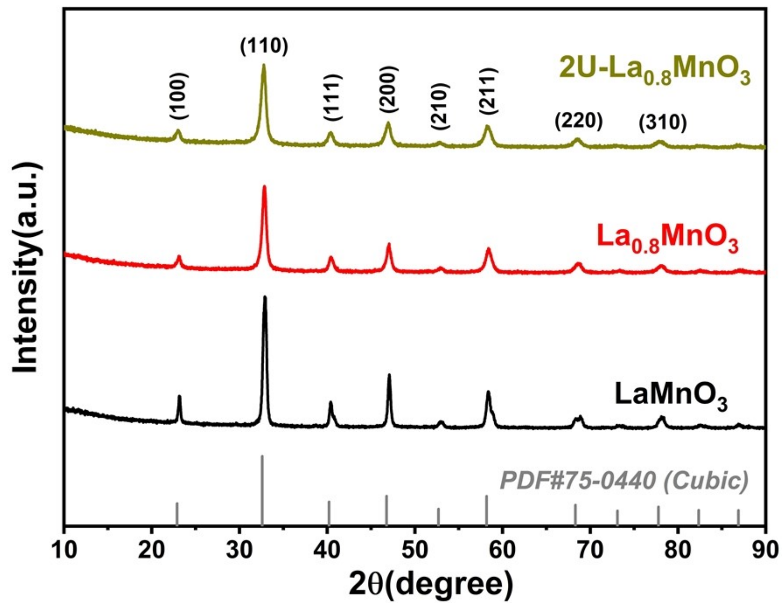

Fig. S1. XRD patterns of $LaMnO_3$, $La_{0.8}MnO_3$ and 2U-$La_{0.8}MnO_3$.

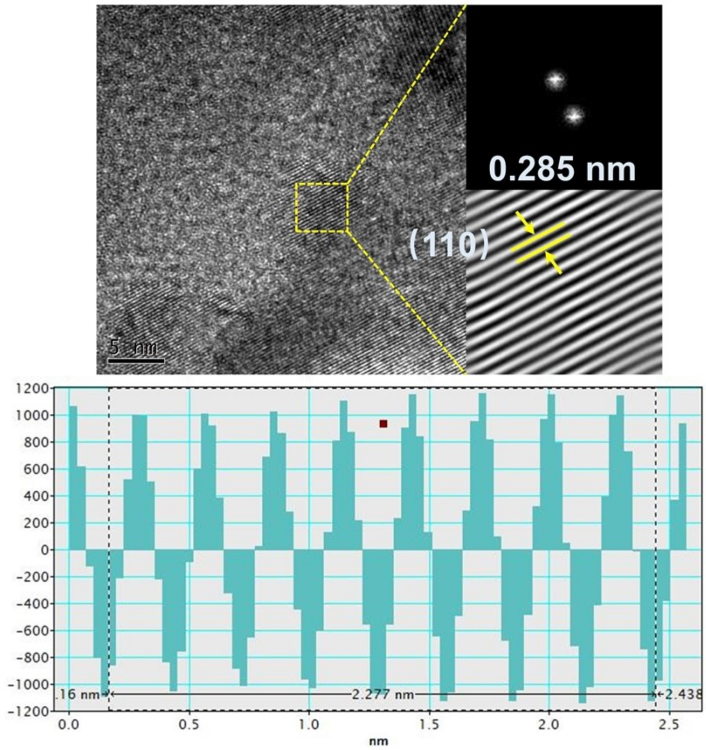

Fig. S2. HRTEM images of 2U-$La_{0.8}MnO_3$.

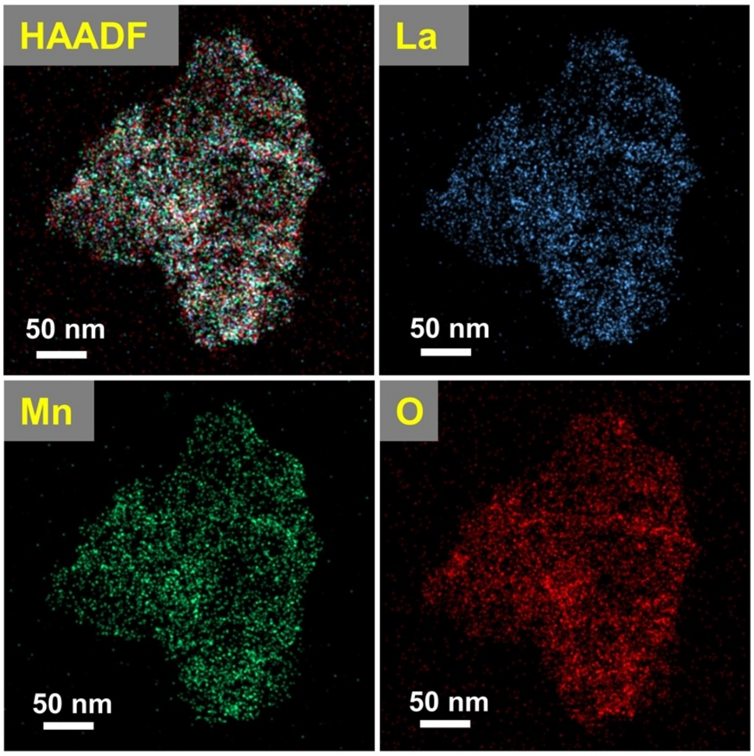

Fig. S3. EDX element mapping images of 2U-$La_{0.8}MnO_3$.

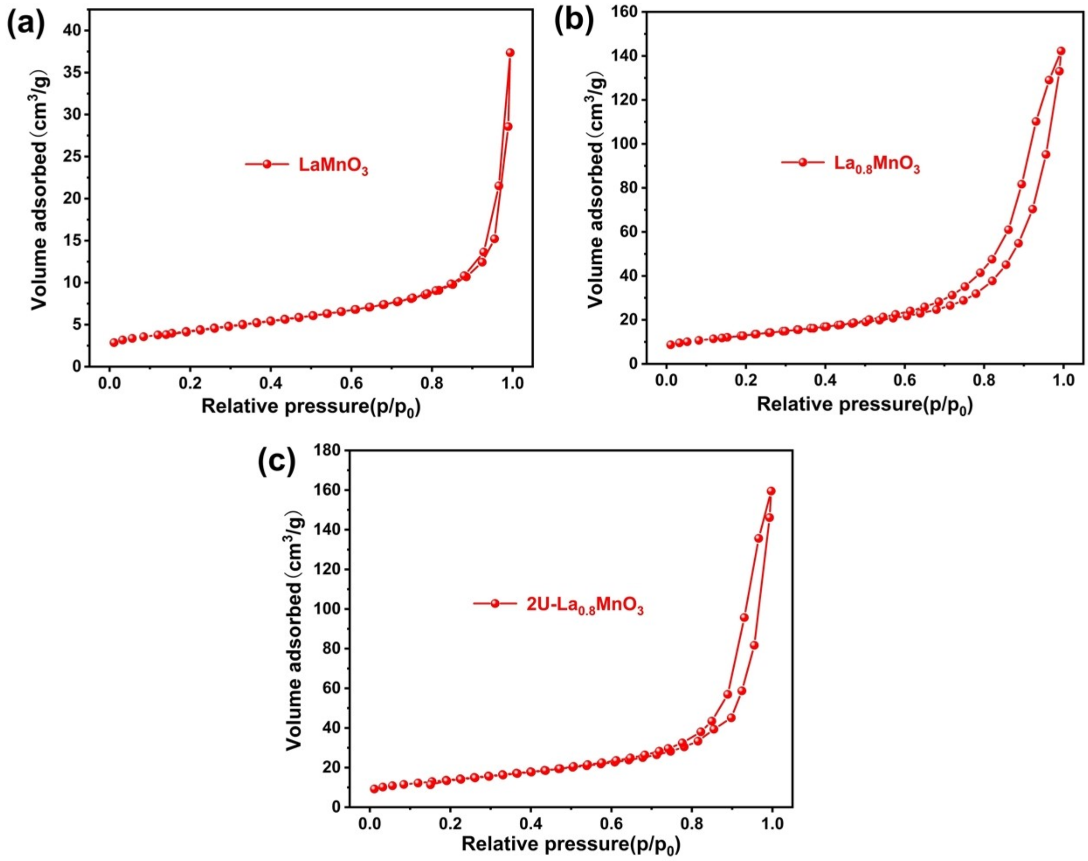

Fig. S4. The nitrogen adsorption-desorption isotherms of $LaMnO_3$, $La_{0.8}MnO_3$ and 2U-$La_{0.8}MnO_3$.

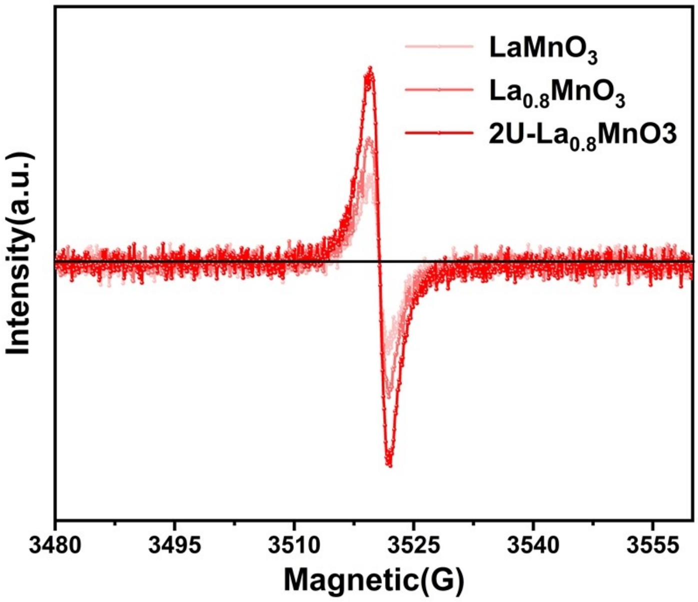

Fig. S5. EPR spectra of $LaMnO_3$, $La_{0.8}MnO_3$ and 2U-$La_{0.8}MnO_3$.

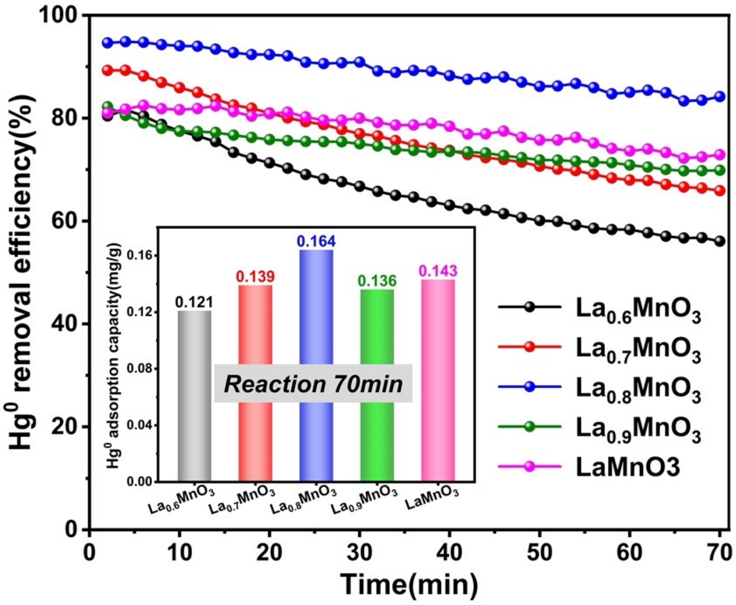

Fig. S6. The Hg^0 removal efficiency of $La_{1-x}MnO_3$ (x= 0, 0.1, 0.2, 0.3, 0.4), and the inset indicate the dynamic adsorption capacity when the Hg^0 breakthrough reached 5%.

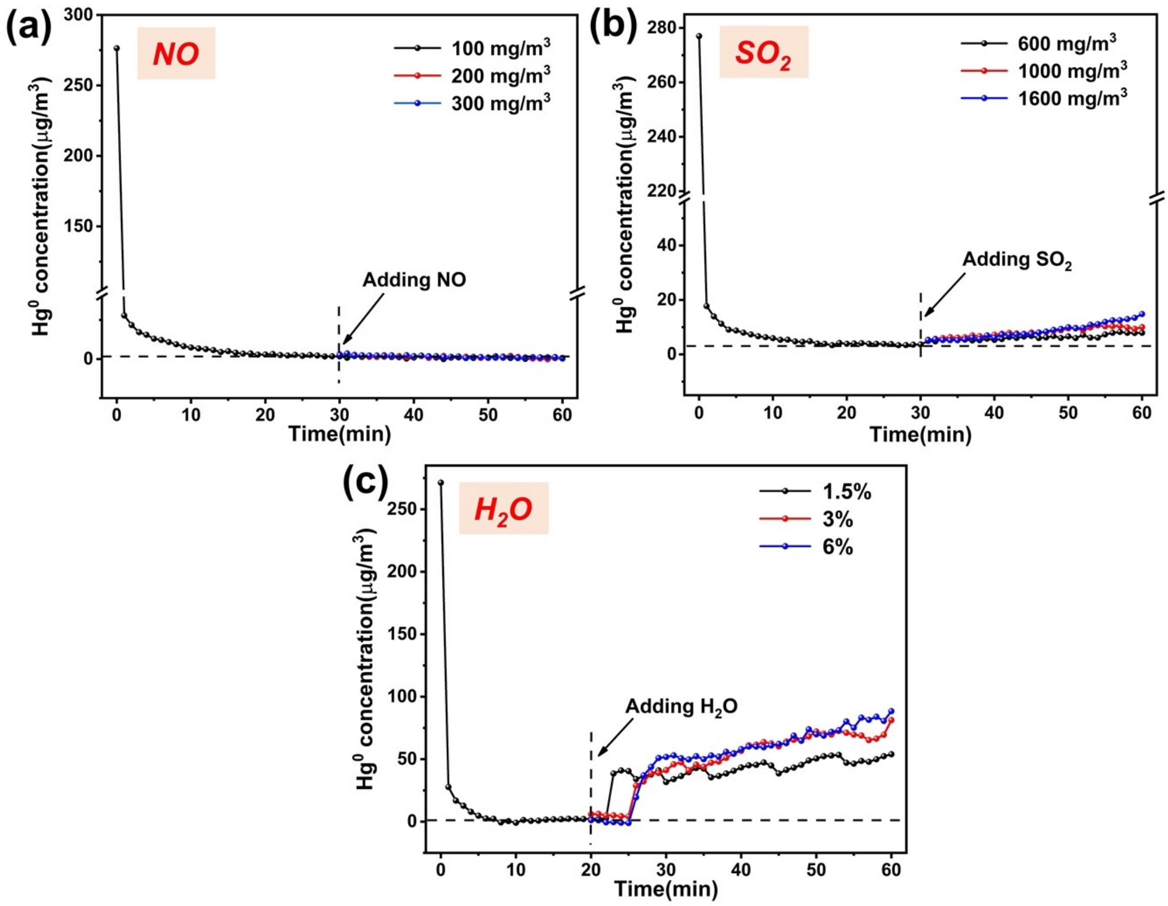

Fig. S7. Influences of (a)NO, (b)SO_2 and (c)H_2O on the Hg^0 removal efficiency.

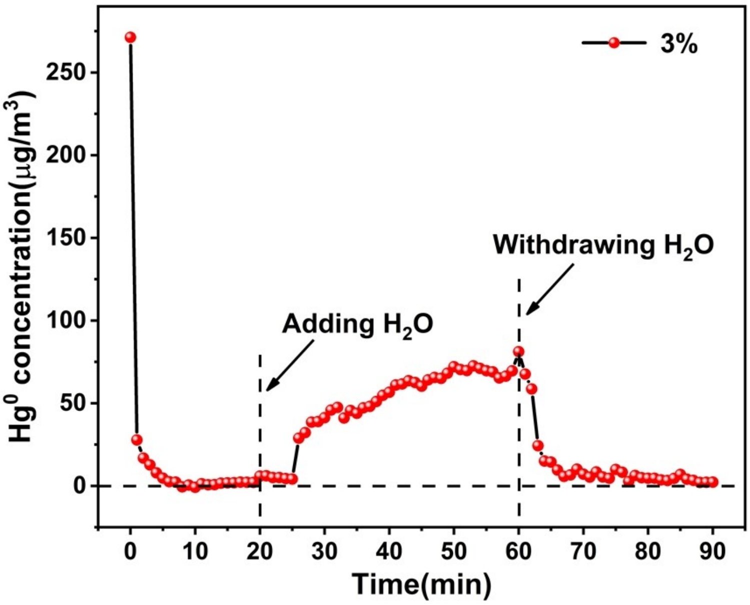

Fig. S8. The dynamic influence of H_2O on the Hg^0 removal efficiency.

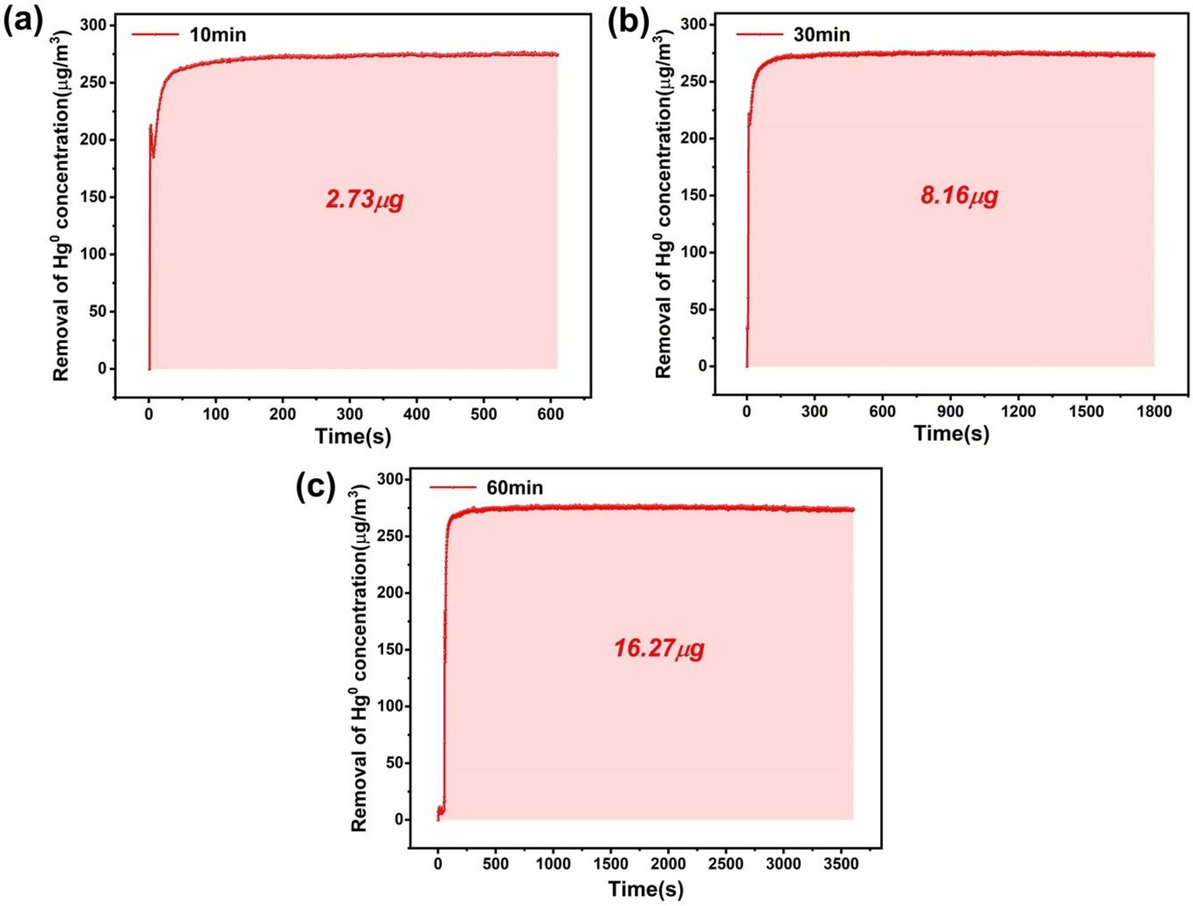

Fig. S9. Experimental calculation of Hg^0 released after reaction for (a) 10, (b) 30 and (c) 60 min.

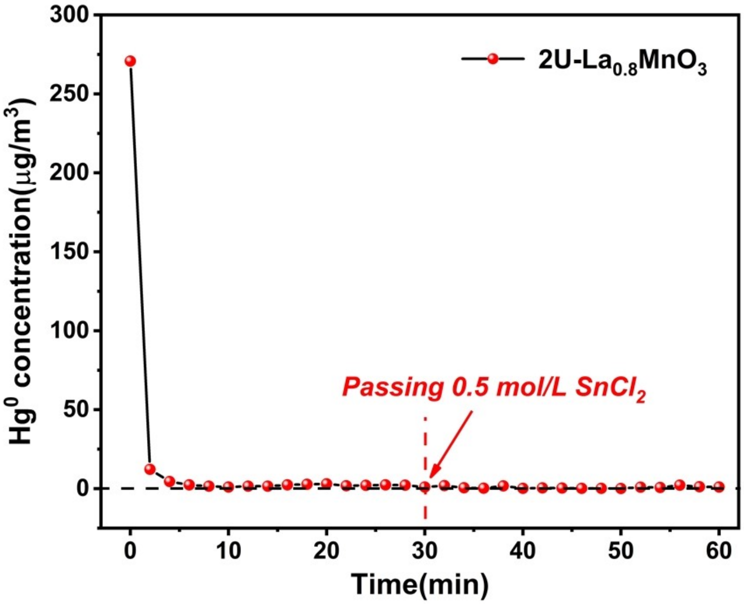

Fig. S10. The Hg^0 removal performance with and without $SnCl_2$ solution.

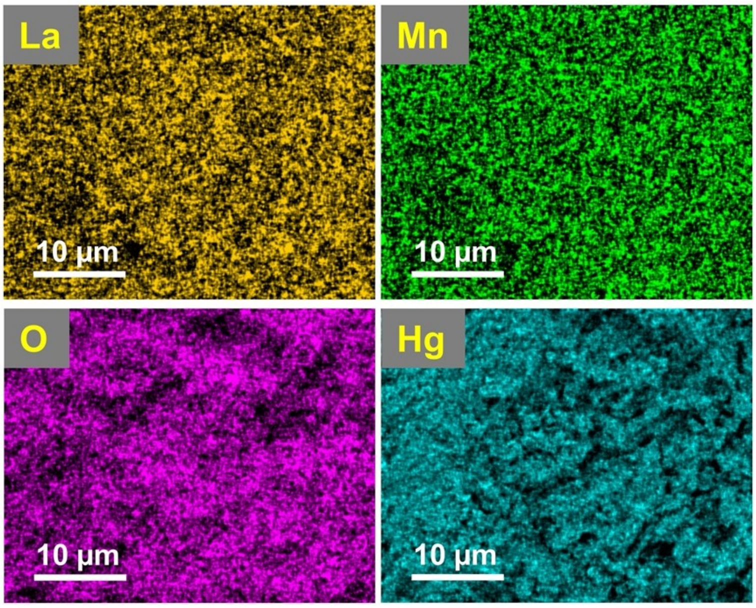

Fig. S11. EDX element mapping images of spent 2U-$La_{0.8}MnO_3$.

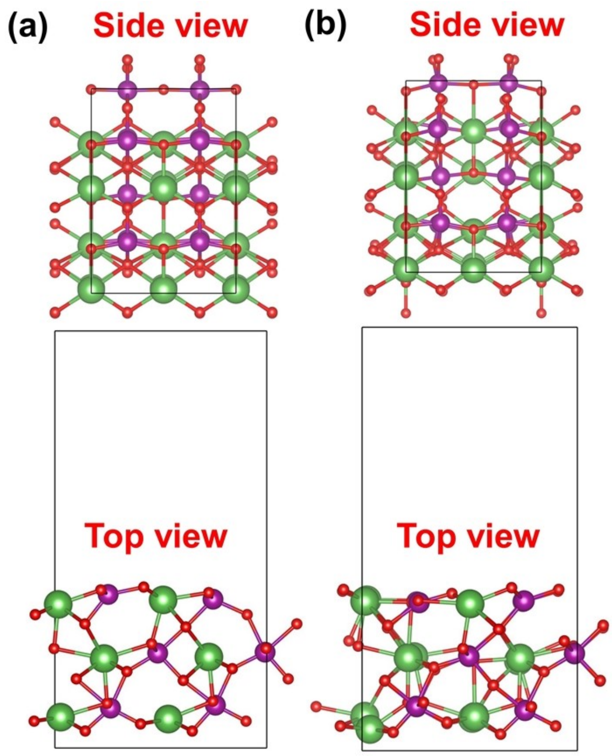

Fig. S12. Calculated side and top view configurations of (a) $LaMnO_3$ and (b) 2U-$La_{0.8}MnO_3$.

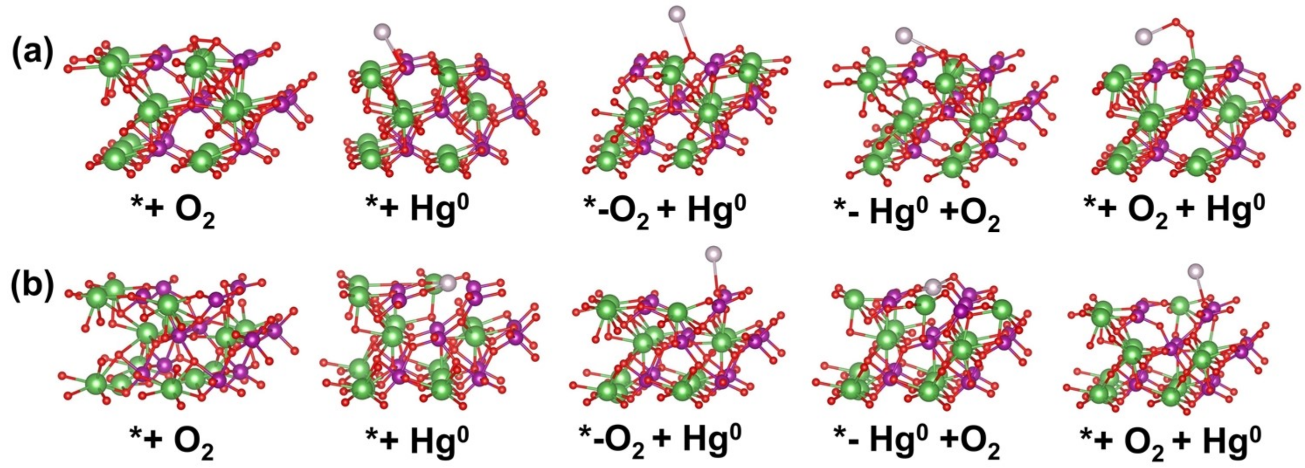

Fig. S13. The configurations of O_2 and Hg^0 on (a) $LaMnO_3$ and (b) 2U-$La_{0.8}MnO_3$ (110) surface (*).

Table S1. The comparison of the Hg^0 adsorption capacity of 2U-$La_{0.8}MnO_3$ with other oxides

Oxides	Temperature	Removal efficiency	Hg^0 Adsorption capacity (mg/g)	Breakthrough ratio/adsorption time	References
2U-$La_{0.8}MnO_3$	40 ~ 250	100%	23.86	100%	**This work**
Mn/γ-Fe_2O_3	200	-	3.54	55%	1
$(Fe_2Ti)_{0.8}O_4$	250	-	3.94	23%	2
α-MnO_2	150	92%	6.94	10 h	3
$LaMnO_3$	150	-	7.65	100%	4
CeO_2/TiO_2	200 ~ 250	> 90%	0.012	4 h	5
$Fe_3O_{4-x}Se_y$	100	100%	8.80	100%	6
MoS_3/TiO_2	100	-	14.90	75%	7
$La_{0.8}Ce_{0.2}MnO_3$	50 ~ 200	> 80%	5.83	30 h	8
Fe_2O_3/TiO_2	50 ~ 150	> 95%	2.69	10 h	9
CeO_2-CrO_x	50 ~ 100	100%	0.168	6.7 h	10
α-Fe_2O_3/SnO_2	400	99%	4.84	2 h	11
$LaFeO_3$	40 ~ 160	> 80%	2.397	1 h	12
Ce-Pd/γ-Al_2O_3	250	> 98%	0.038	4.2 h	13

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