**Evaluating the Activity and Stability of Perovskite LaMO3-based Pt Catalysts in the Aqueous Phase Reforming of Glycerol Supplementary Information**

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**Table S1.** Database ICDD PDF patterns for materials

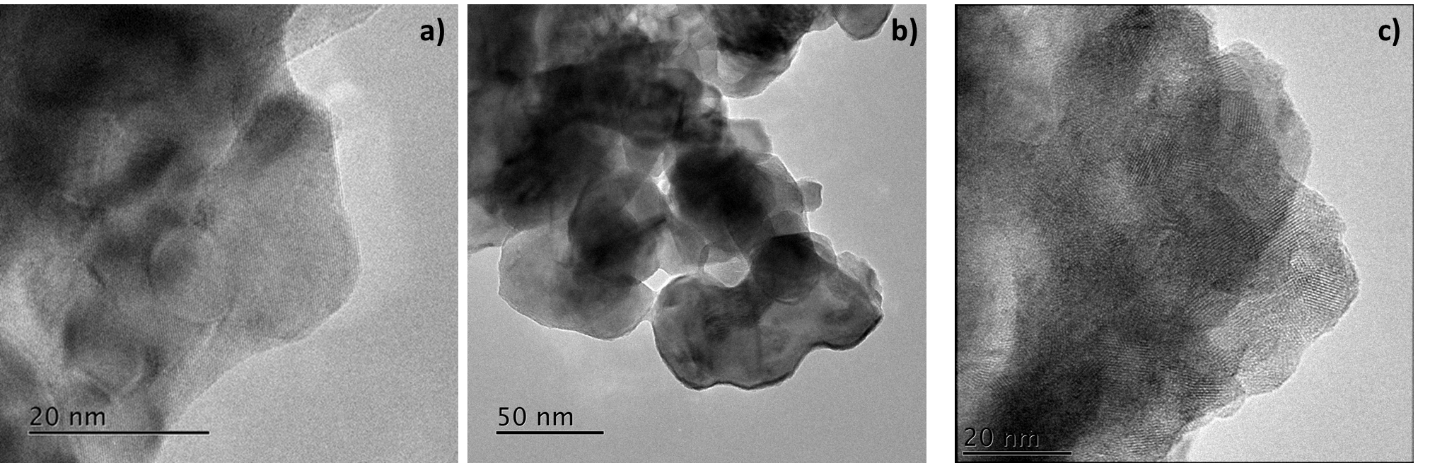
|  |  |
| --- | --- |
| **Material** | **ICDD PDF Pattern No.** |
| Al2O3 | PDF 29-0063 |
| LaAlO3 | PDF 31-0022 |
| LaCrO3 | PDF 33-0701 |
| LaCrO4 | PDF 36-0093 |
| LaMnO3 | PDF 32-0484 |
| LaFeO3 | PDF 37-1493 |
| LaCoO3 | PDF 25-1060 |
| LaNiO3 | PDF 34-1181 |
| NiO | PDF 47-1049 |
| Ni | PDF 04-0850 |
| LaCO3OH | PDF 26-0815 |
| La2O(CO3)2.xH­2O | PDF 28-0512 |
| Fe3O4 | PDF 03-0863 |
| La(OH)3 | PDF 36-1481 |
| Co(OH)2 | PDF 30-0443 |

**Figure S1.** Thermogravimetric analysis (TGA) of combusted precursor powders of LaAlO3 (black), LaCrO3 (red), LaMnO­3 (blue), LaFeO3 (green), LaCoO3 (pink), and LaNiO3 (orange). 

**Table S2.** Normalised TOF values

|  |  |  |
| --- | --- | --- |
| Catalysta | TOF glycerol  (mol/mol of surface Pt/h) | Hydrogen Formation Rate  (umol/min/m2(Pt)) |
| Pt/γ-Al2O3 | 665.6 | 1996.3 |
| Pt/LaAlO3 | 1359.48 | 2752.1 |
| Pt/LaCrO3 | 581.9 | 1484.5 |
| Pt/LaMnO3 | 750.4 | 3039.7 |
| Pt/LaFeO3 | 513.0 | 1691.3 |
| Pt/LaCoO3 | 443.4 | 2279.4 |
| Pt/LaNiO3 | 847.1 | 1549.2 |

**Figure S2.** TEM micrograph of fresh a) Pt/LaAlO3,b) Pt/LaCoO3, c) Pt/LaNiO3

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**Figure S3.** Pt L3 edge EXAFS Fourier Transform χR (left) and χk (right) of Pt/Al2O3 *a) Fresh, b) Used.*

**Figure S4.** Pt L3 edge EXAFS Fourier Transform χR (left) and χk (right) of PtLaAlO3 *a) Fresh, b) Used.*

**Figure S5.** Pt L3 edge EXAFS Fourier Transform χR (left) and χk (right) of PtLaCrO3 *a) Fresh, b) Used.*

**Figure S6.** Pt L3 edge EXAFS Fourier Transform χR (left) and χk (right) of PtLaCoO3 *a) Fresh, b) Used.*

**Figure S7.** Pt L3 edge EXAFS Fourier Transform χR (left) and χk (right) of PtLaFeO3 *a) Fresh, b) Used.*

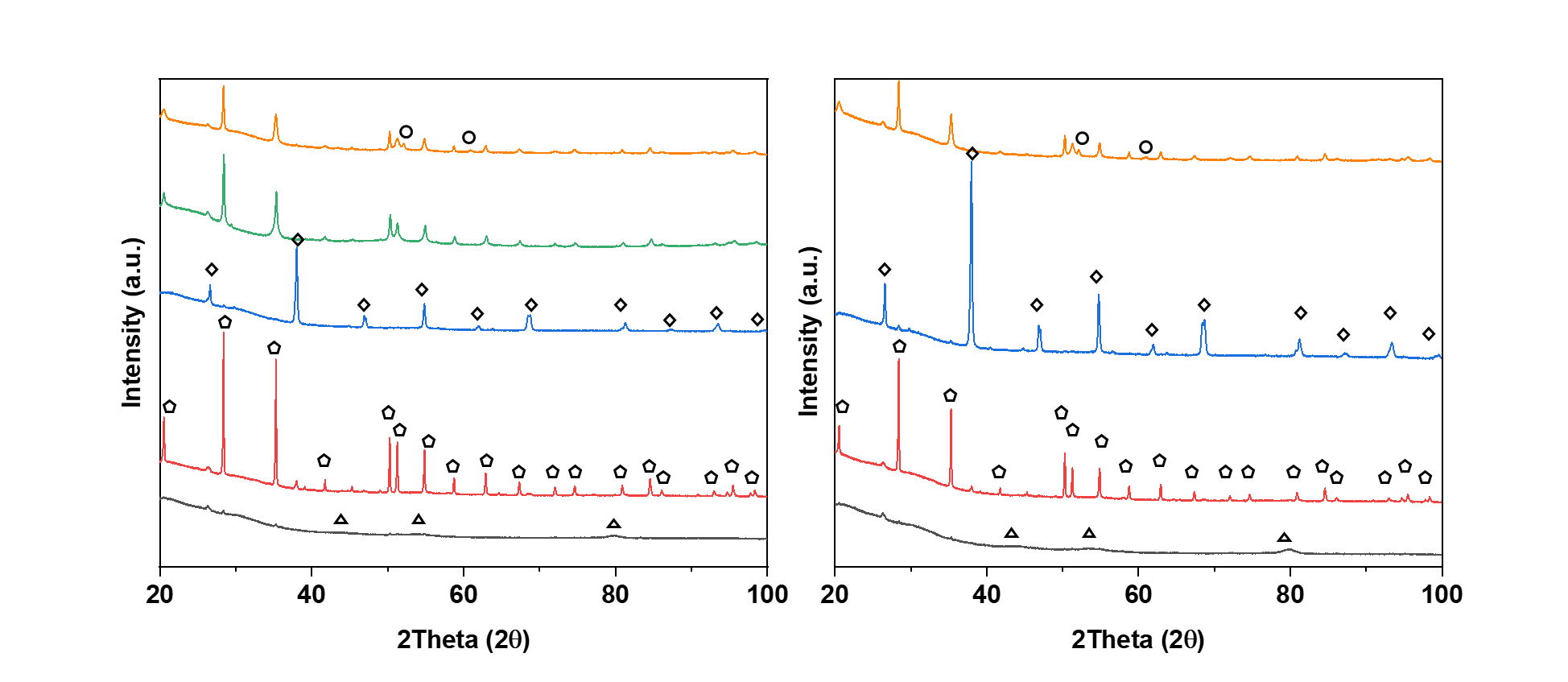
**Figure S8.** Pt L3 edge EXAFS Fourier Transform χR (left) and χk (right) of PtLaMnO3 *a) Fresh, b) Used.*



**Figure S9.** Pt L3 edge EXAFS Fourier Transform χR (left) and χk (right) of PtLaNiO3 *a) Fresh, b) Used.*



**Figure S10.** XRD patterns of Pt/Al2O3 (black), Pt/LaAlO3 (red), Pt/LaCrO3 (blue), Pt/LaMnO3 (green), and Pt/LaNiO3 (orange) post reaction 2 (left) and 3 (right). Phases:  γ-Al2O3;  LaCO3OH;  perovskite; Ni.



**Figure S11.** XPS Cr 2p region for fresh and recycled catalysts up to 3 cycles.



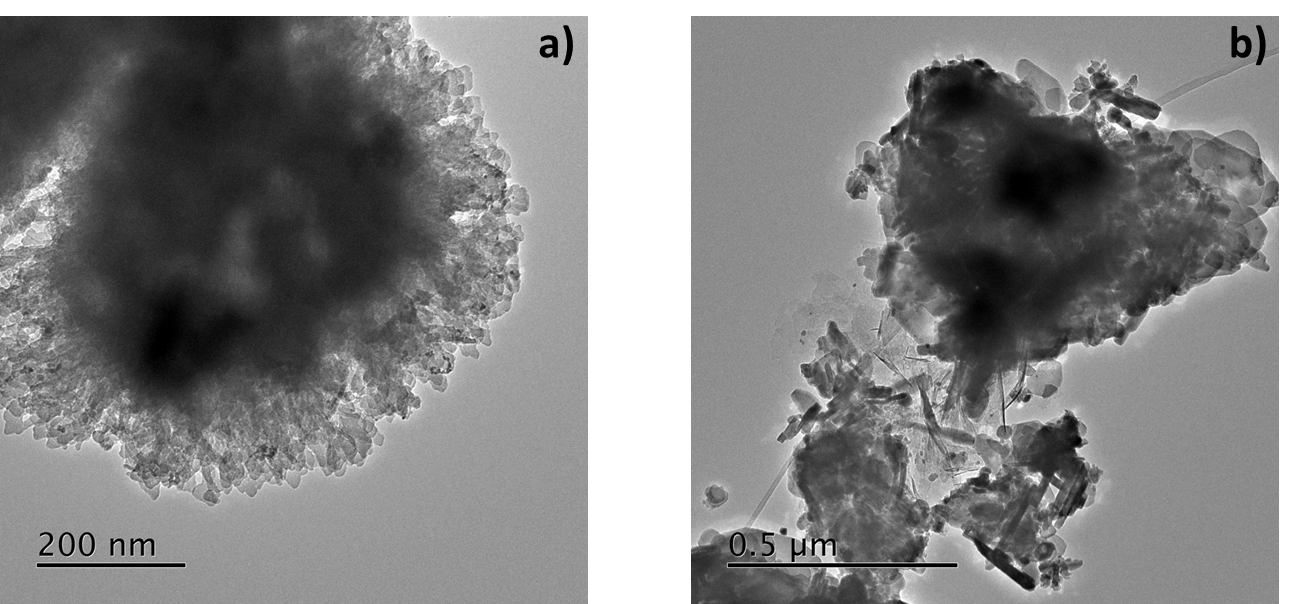
**Figure S12.** Pt L3 edge EXAFS Fourier Transform χR (left) of PtLaNiO3 Used *a) Pt-Ni path, b) Pt-Pt path, c) Pt-Ni and Pt-Pt path.*



**Table S3.** EXAFS fitting for Pt L3 edge of PtLaNiO3 Used *a) Pt-Ni path, b) Pt-Pt path, c) Pt-Ni and Pt-Pt path.*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Fit | Scattering Path | Coordination Number | *2σ2* (Å2) | *R* (Å) | *Ef* (eV) | *R*factor |
| a) | Pt-Ni | 7.1(8) | 0.0067(9) | 2.54(6) | -3(1) | 0.021 |
| b) | Pt -Pt 1.1 | 12(6) | 0.007(3) | 2.50(3) | -27(5) | 0.30 |
| c) | Pt-Ni  Pt-Pt 1.1 | 6(1)  2(2) | 0.005(1)  0.005(5) | 2.530(9)  2.66(3) | -3(2) | 0.014 |
| Fixed parameters : So2 = 0.81 | | | | | | |

**Figure S13.** TEM micrograph of a) Pt/LaMnO3 post reaction 2, b) Pt/LaNiO3 post reaction 3

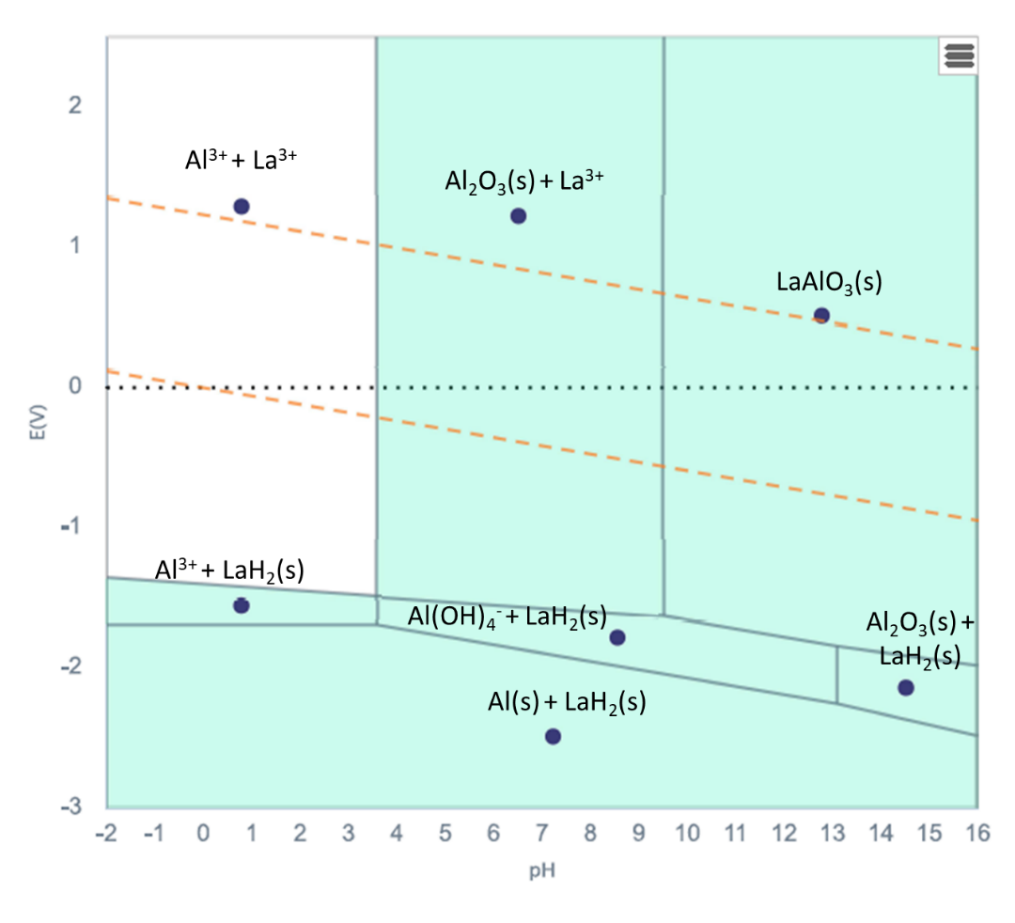


**Table S4.** *Bond Dissociation Energies in Diatomic Cations at 298 K; Data is from* CRC Comprehensive Handbook of Chemical Bond Energies [1]

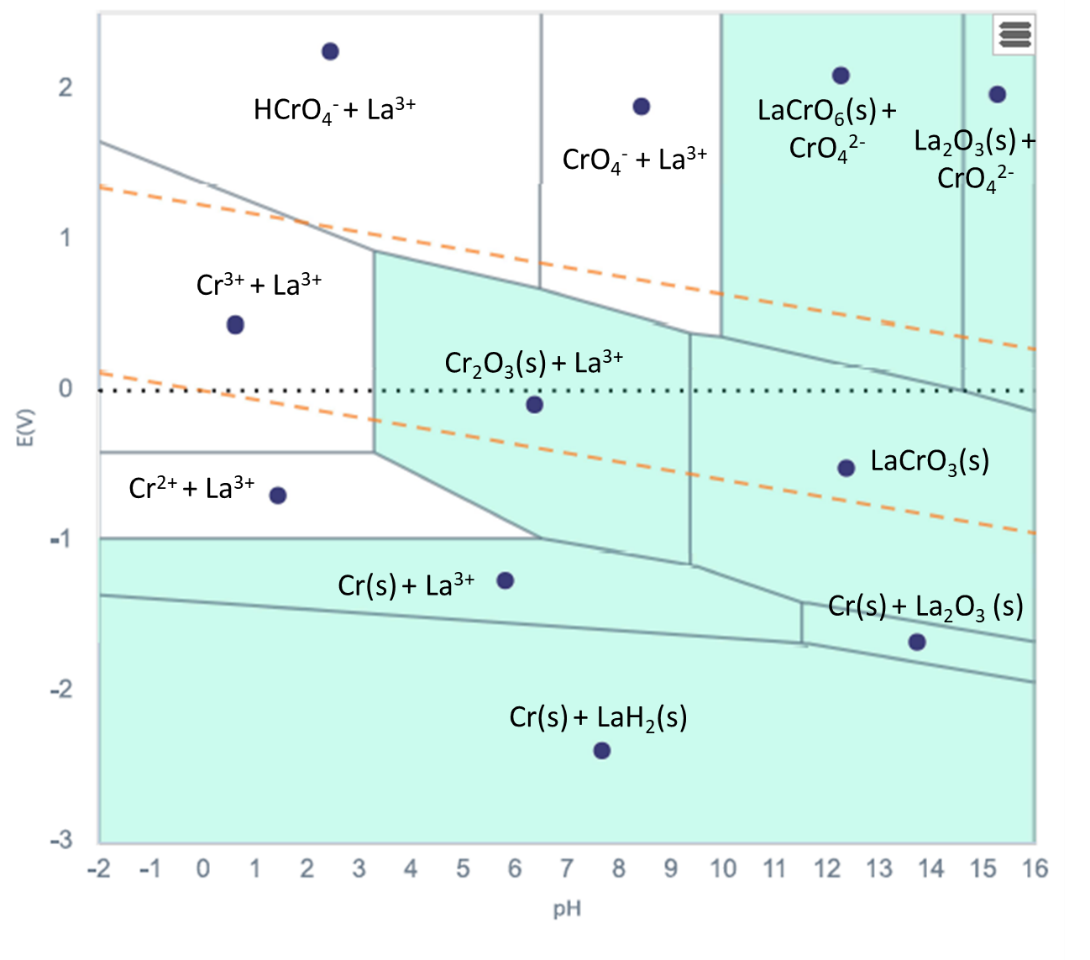
|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Al+-O | Cr+-O | Mn+-O | Fe+-O | Co+-O | Ni+-O |
| Do298 kJmol-1 | 166.7 ± 12.0 | 359 | 285 ± 13 | 334 ± 6 | 317.3 ± 4.8 | 275.9 ± 7.7 |

1. Luo YR (2007) Comprehensive Handbook of Chemical Bond Energies, 1st ed. CRC Press, Boca Raton, FL

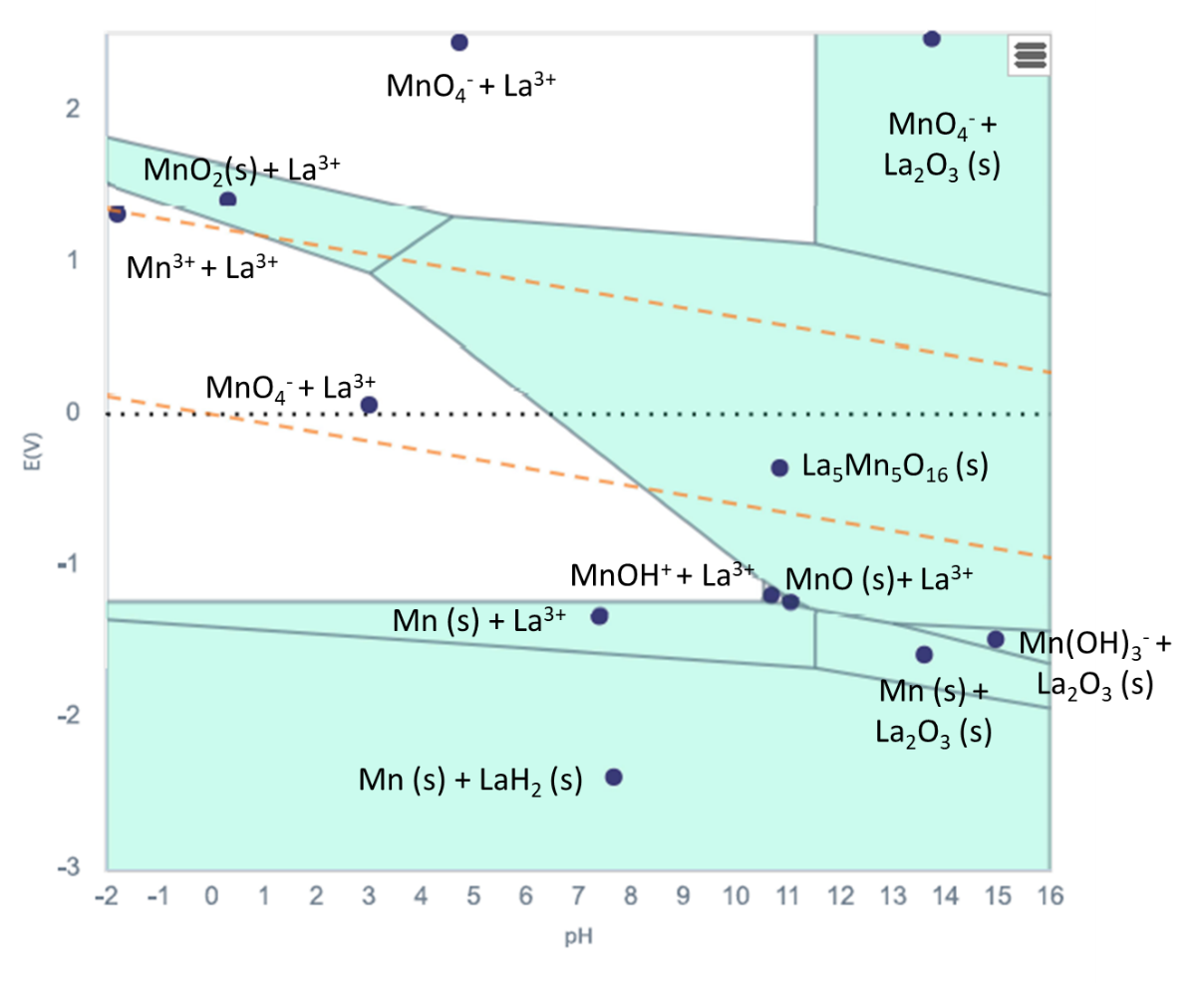
**Figure S14.** Calculated Pourbaix diagram for LaAlO3



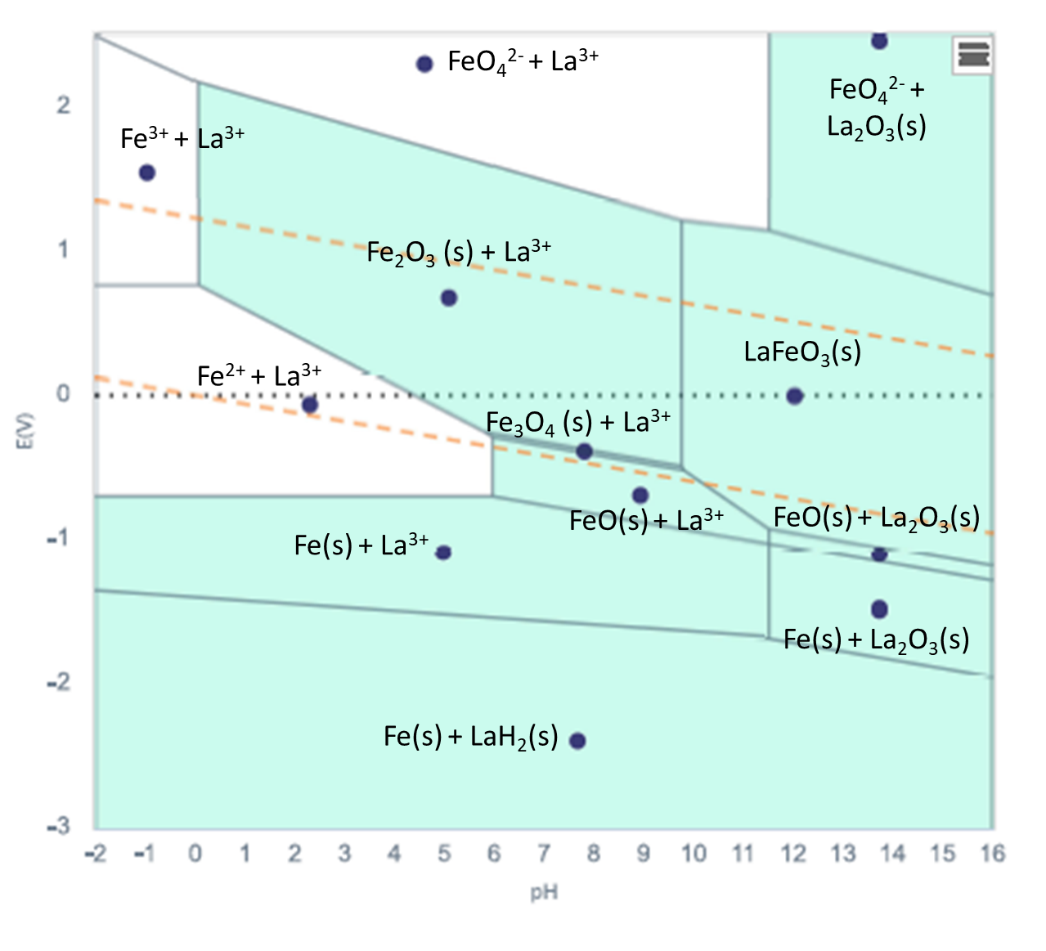
**Figure S15.** Calculated Pourbaix diagram for LaCrO3



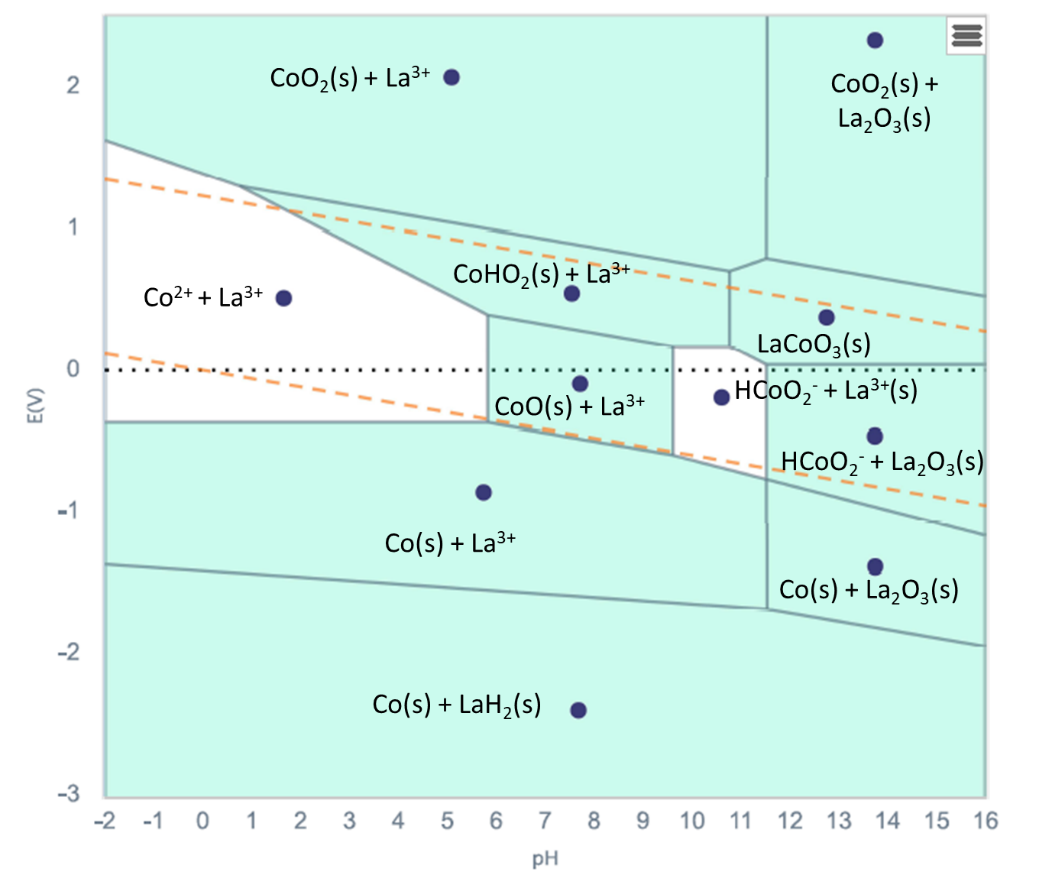
**Figure S16.** Calculated Pourbaix diagram for LaMnO3



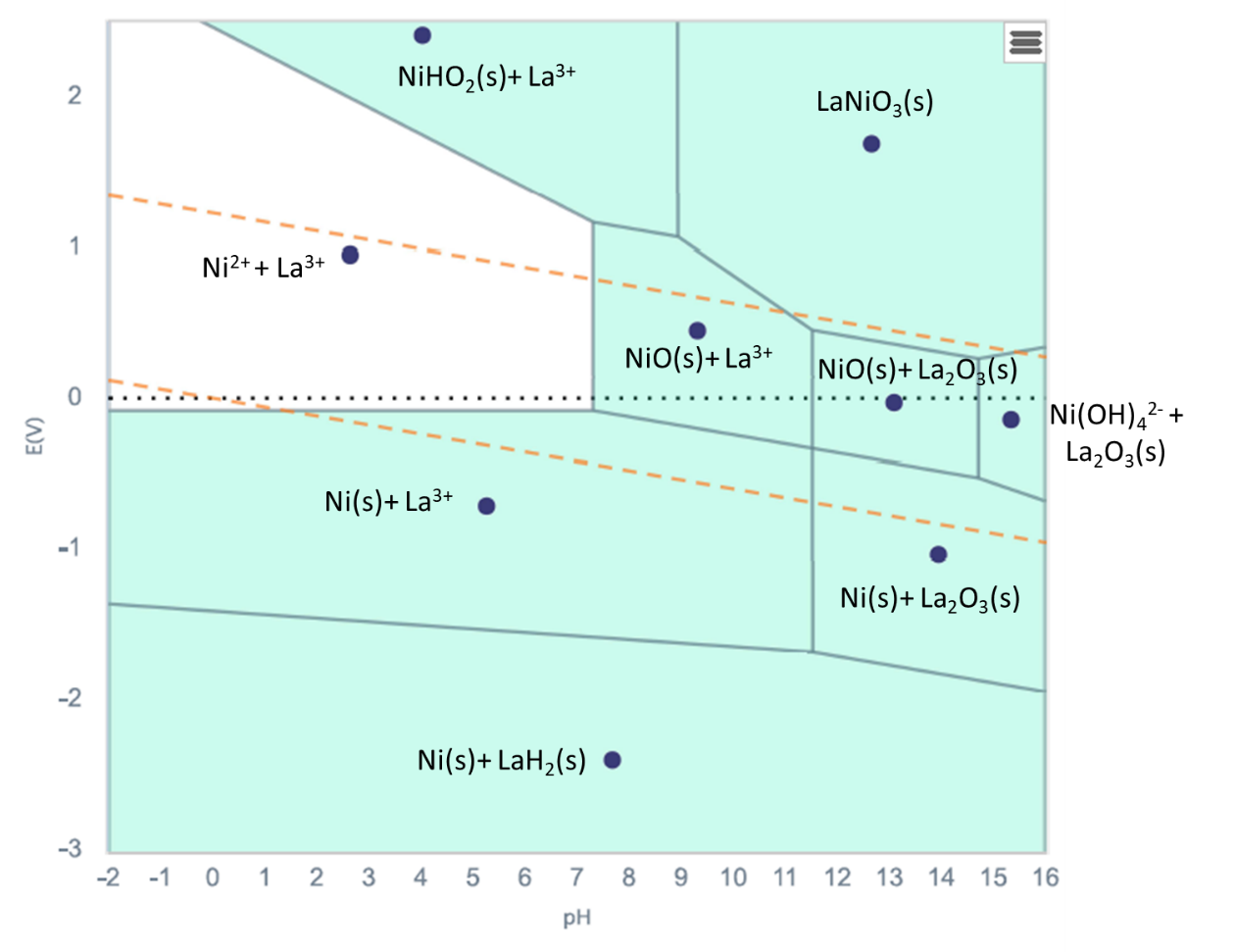
**Figure S17.** Calculated Pourbaix diagram for LaFeO3



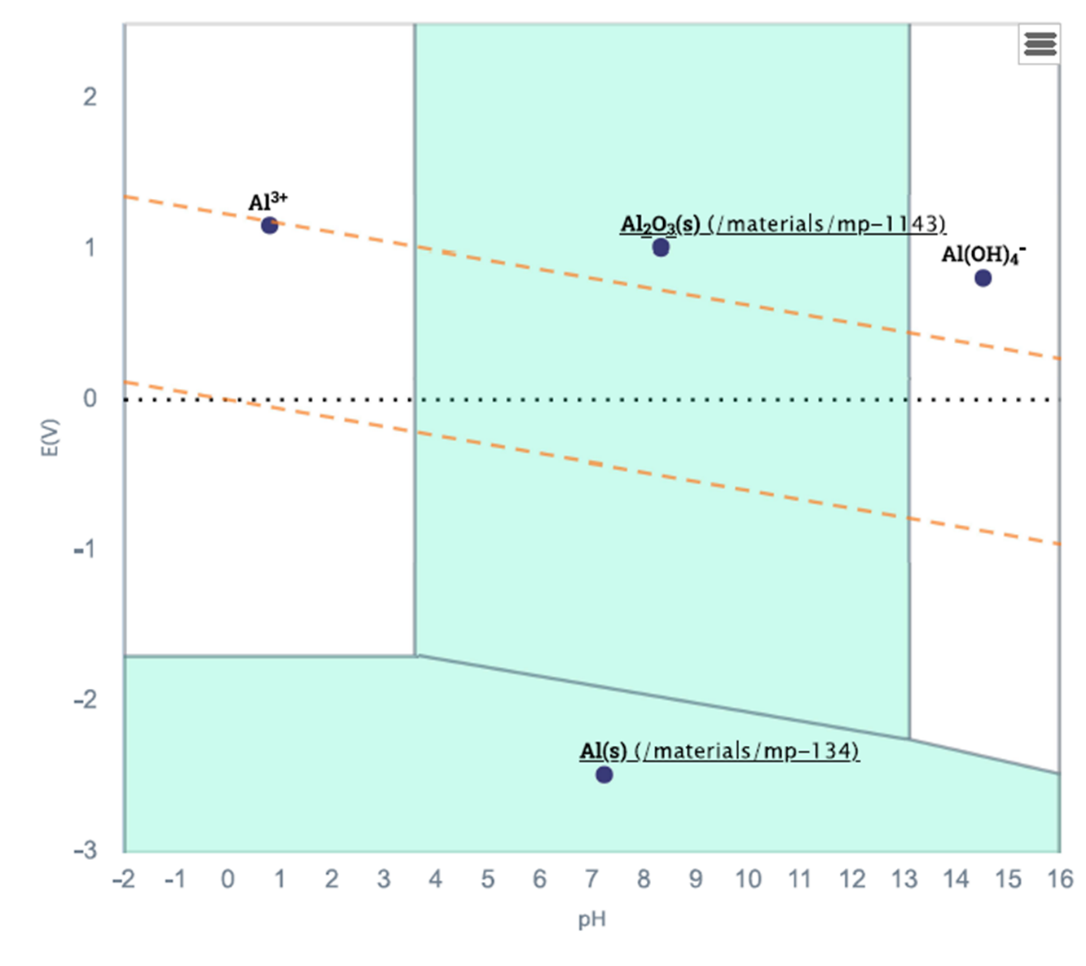
**Figure S18.** Calculated Pourbaix diagram for LaCoO3



**Figure S19.** Calculated Pourbaix diagram for LaNiO3



**Figure S20.** Calculated Pourbaix diagram for Al2O3



**Figure S21.** Calculated Pourbaix diagram for Lanthanum-carbon species

