Crystallinity of Perovskite Thin Films Supported on Different Oxides

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Perovskite thin films decorated with catalytic metals supported on high-specific-area oxides have demonstrated fascinating catalytic performance and impressive stability in reforming reactions of hydrocarbons [1] and automotive emission control [2]. In present research, we investigated the interaction between the perovskite overlayer and its supporting oxide. $LaFeO_3$ and $CaTiO_3$ thin films with equivalent thickness of ~0.5 nm were deposited to different supporting materials such as $MgAl_2O_4$, γ-Al_2O_3 and amorphous SiO_2. X-ray diffraction results shown that films deposited to the crystalized supports tend to possess high degree of crystallinity after high temperature oxidation, while those deposited to the amorphous support (SiO_2) did not crystalize themselves during the same oxidation process. Catalytic performance of Pt-$LaFeO_3$ thin film supported on SiO_2 was tested and compared with Pt-$LaFeO_3$ supported on $MgAl_2O_4$. Both catalysts showed similar catalytic performances in CO oxidation reaction, however $LaFeO_3$ thin film deposited to SiO_2 was less stable than its analog supported on $MgAl_2O_4$. Metallic Fe and La_2O_3 were found in the XRD pattern of the SiO_2 supported sample after reduction at 1073 K, which has never been seen in the $MgAl_2O_4$ supported systems.

References

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