Subnano Pt-CoO_x Clusters with Optimized Metal-Oxide Interfaces Enhance Catalytic Activity

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The oxide support has been found to have a remarkable promotion effect on catalytic activity. Decoration of transition metal oxide on metal NPs is an alternative way to create metal-oxide interfaces and improve metal NP stability. Maximizing metal-oxide interface and disclosing the interface structure under realistic reaction conditions are of great importance for optimizing catalytic performance and establishing structure-activity relations.

We prepared samples using the ALD method and measured samples with the HADDF-STEM, DRIFTS. Especially, In situ XAFS measurements were performed to track the structure evaluation of Pt and Co species in different environments

We reported a new strategy of fabricating subnano Pt-CoO_x clusters with rich Pt-CoO_x interfaces by selectively depositing CoOx onto the $PtCl_x^{\delta-}$ ions. Then we have used in-situ XAFS to unveil the structure of catalyst under different treatment and reveal the the atomic structure of metal-oxide. As a result, confirming electrostatic interaction and strong Pt-CoO_x interaction both play important roles in inhibiting severe Pt aggregations to form subnano Pt-CoO_x clusters.Most important , our Pt-CoO_x catalyst exhibited extremely high catalytic activity, selectivity and stability, by achieving 100% CO conversion and 100% CO selectivity in a broad temperature range of ~25-140^oC in the PROX reaction. These findings pave a new way to optimize metal-oxide interface for advanced catalysis.