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Hydrothermal synthesis of $NiCeO_x$ nanosheets and its application to the total oxidation of propane

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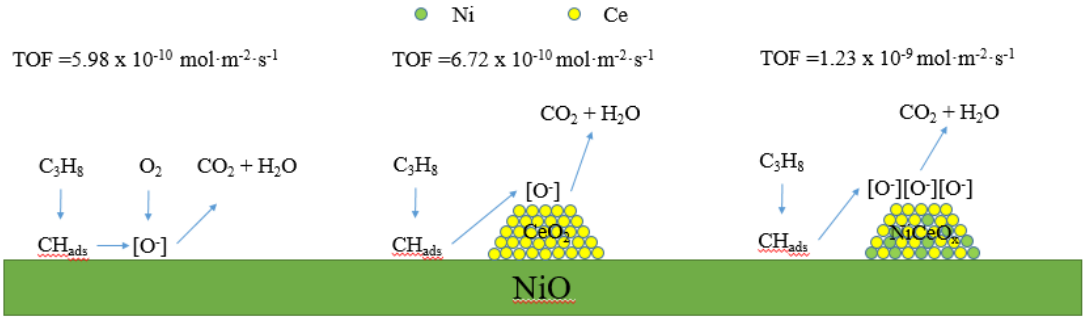
Graphical Abstract



Highlights

- The preparation method affects the activity of $NiCeO_x$ oxide for propane oxidation.
- Hydrothermal synthesis ($NiCeO_x$-4) is beneficial to the activity of $NiCeO_x$ oxide.
- Ni-containing CeO_2 nanoparticles are present on the $NiCeO_x$-4 surface.
- The reducibility and active oxygen species amount are the key to the activity.

ABSTRACT: A series of $NiCeO_x$ mixed metal oxide catalysts with various Ce/(Ce + Ni) ratios were prepared using hydrothermal methods. The $NiCeO_x$ catalyst with a 4% Ce/(Ni + Ce) molar ratio ($NiCeO_x$-4) demonstrated excellent catalytic performance for propane oxidation. Furthermore, the preparation method strongly affected the morphology and surface structure of the $NiCeO_x$-4 catalyst as well as its catalytic activity for propane oxidation. The $NiCeO_x$-4 catalyst that was prepared with the hydrothermal method exhibited a better catalytic performance compared with catalysts that were prepared by the co-precipitation method, sol-gel method and physical mixing of pure NiO and CeO_2 powders. The results demonstrated that Ni-containing CeO_2 ($NiCeO_x$) nanoparticles were located on the surface of the $NiCeO_x$-4