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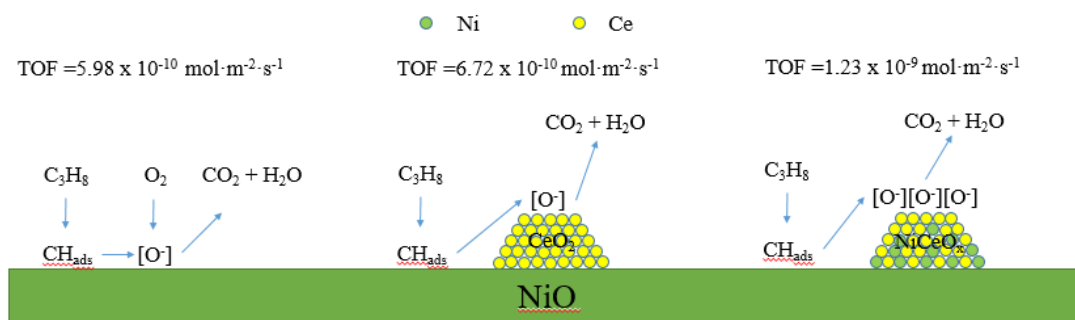
# Hydrothermal synthesis of NiCeO<sub>x</sub> nanosheets and its application to the total oxidation of propane

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## Graphical Abstract



## Highlights

- The preparation method affects the activity of NiCeO<sub>x</sub> oxide for propane oxidation.
- Hydrothermal synthesis (NiCeO<sub>x</sub>-4) is beneficial to the activity of NiCeO<sub>x</sub> oxide.
- Ni-containing CeO<sub>2</sub> nanoparticles are present on the NiCeO<sub>x</sub>-4 surface.
- The reducibility and active oxygen species amount are the key to the activity.

**ABSTRACT:** A series of NiCeO<sub>x</sub> mixed metal oxide catalysts with various Ce/(Ce + Ni) ratios were prepared using hydrothermal methods. The NiCeO<sub>x</sub> catalyst with a 4% Ce/(Ni + Ce) molar ratio (NiCeO<sub>x</sub>-4) demonstrated excellent catalytic performance for propane oxidation. Furthermore, the preparation method strongly affected the morphology and surface structure of the NiCeO<sub>x</sub>-4 catalyst as well as its catalytic activity for propane oxidation. The NiCeO<sub>x</sub>-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<sub>2</sub> powders. The results demonstrated that Ni-containing CeO<sub>2</sub> (NiCeO<sub>x</sub>) nanoparticles were located on the surface of the NiCeO<sub>x</sub>-4

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