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In situ analysis of propane oxidation on Ru/CeO₂ catalyst by NAP-XPS

Content

Supported ruthenium catalysts are considered promising for catalytic oxidation of volatile organic compounds (VOCs) [1], which can be dangerous for human health. A significant catalytic activity of Ru on cerium dioxide can be especially noticed in the oxidation of light hydrocarbons. Due to high oxygen storage capacity and redox properties, CeO₂ is considered an “active” support [2, 3], which can, during oxidation processes, provide an abundance of active oxygen for redox reactions and thus increase the reaction rate.

Using near-ambient pressure X-ray photoelectron spectroscopy (NAP-XPS), the chemical state of ruthenium in Ru/CeO₂ catalyst was studied under simulated realistic conditions of pre-treatments (calcination and reduction) and C₃H₈ oxidation, allowing better understanding of correlations between the chemical state of ruthenium and its activity in C₃H₈ oxidation. It is shown that the Ru/CeO₂ interaction with an oxygen-rich atmosphere (C₃H₈+O₂ (1:5)) at ≥300 °C results in ruthenium oxidation to the volatile RuO₄, leading to its homogeneous redispersion inside the powder catalyst and increased catalytic activity.

References:

- [1] A. E. Hughes, N. Haque, S. A. Northey and S. Giddey, Resources, 2021, 10.
- [2] A. Trovarelli and J. Llorca, ACS Catalysis, 2017, 7, 4716–4735.
- [3] Z. Rafaj, J. Krutel and V. Nehasil, Journal of Physical Chemistry C, 2021, 125, 15959–15966.

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