

Operando high energy XRD of Cu/La_{0.5}Sr_{0.5}CoO₃ TWC under oscillating feed

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Copper is considered a possible candidate to replace precious metals in future three-way catalysts. Its performance as catalyst was assessed in operando conditions. A 20 wt% CuO/La_{0.5}Sr_{0.5}CoO₃ catalyst was studied under oscillating redox conditions while subjected to a temperature cycle 100–400–100°C. Mass spectrometry was used to monitor gas compositions while time-resolved XRD diffraction data was used to monitor phase transitions and structural changes. Rietveld analysis of the data reveals the irreversible decomposition of CuO to Cu₂O and Cu and reversible conversion of the perovskite support to a brownmillerite phase at high temperatures. The perovskite host itself is also sensitive to the redox environment, thus the oscillations of the gas feed are reflected in the phase composition. The redox oscillations are also responsible for the increased NO reduction activity. The analysis is complicated by the presence of some not yet identified decomposition products and the rather low resolution in 2 Θ .

Position

Scientist

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