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Formation of CeO₂ in CeTiO₂ catalyst studied by the in situ XANES

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Cerium-doped titanium dioxide was prepared by a sol-gel method using Titanium(IV)-isopropoxide and Ce(NO₃)₃•6H₂O as the Ti and Ce precursors. X-ray absorption near edge structure (XANES) measurement was performed on the time-resolved XAS (Bonn-SUT-SLRI) beamline at Synchrotron Light Research Institute, Thailand. The beamline employs an energy dispersive monochromator and the position sensitive detector to record an XANES spectrum. For as prepared Ce/TiO₂, XANES spectra show mainly the characteristic peaks due to the Ce³⁺. To monitor transition mechanism between Ce³⁺ and Ce⁴⁺ in Ce/TiO₂, the in situ XANES measurements were performed. Ce L₃-edge XANES spectra were recorded in 5 K intervals from 573 K to 823 K. Each spectrum was recorded at 250 ms with the averaging of 10 scans. At temperature lower than 763, there was no significant changes of whiteline peak. Two peaks corresponding to the CeO₂ were clearly observed at 808 K. Although the calcinations temperature was increased to 823 K, there was no significant change in Ce L₃-edge XANES spectra. This result indicated the sufficient temperature for CeO₂ formation.

Keywords

Ce/TiO₂, in situ XANES

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