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Effects of Thermal Annealing and X-ray Exposure on Local Structures Surrounding Co in (Y. Co)-codoped CeO_2 Nanocrystals TAI-SING WU, HORNG-TAY JENG, National Tsing Hua University, Taiwan, SHIH-LIN CHANG, National Synchrotron Radiation Research Center, Taiwan, YUN-LIANG SOO, National Tsing Hua University, Taiwan — Codoping of Y and Co in CeO_2 has been found to incur an unconventional bandgap narrowing effect in the host nanocrystal material. The dormant bandgap-tuning ability of Y appears to be turned on by the Co codopant in the oxygen-vacancy-rich CeO_2 host. The physical mechanism underlying such effect has also been revealed by DFT calculations. Synchrotron-Radiation-based X-ray absorption analysis has further demonstrated that the Co codopant atoms can be located in either of two different local bonding environments in the CeO_2 host. Thermal annealing is capable of driving Co atoms from one bonding environment to the other. On the other hand, when exposed to x-rays of sufficient photon energy, Co can resume the original local structure as in the as-made sample. A simple model is proposed to explain such intriguing interplay between the effects of annealing and x-ray exposure in these codoped nanoceria systems.

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