

Optical Properties of Yttria-Stabilized Zirconia Single-Crystals Doped with Terbium Oxide

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3. Results and Discussion

3.1. Crystal phase structure analysis

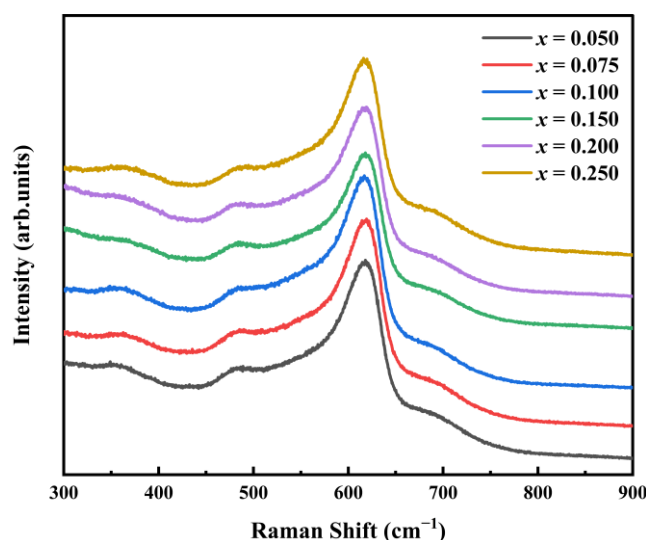


Figure S1. Raman spectra of $(\text{ZrO}_2)_{92}(\text{Y}_2\text{O}_3)_{8-x}(\text{Tb}_4\text{O}_7)_x$ ($x = 0.050\text{--}0.250$) crystals before annealing.

3.2. XPS

The Zr 3d core energy level spectra at 184.8 and 182.4 eV (Figure S2) correspond to the Zr 3d_{3/2} and Zr 3d_{5/2} spin-orbit doublet states. These were shifted slightly to 184.7 and 182.2 eV in the annealed sample. Similarly, the core energy level spectrum of Y³⁺ 3d contains peaks from the Y 3d_{3/2} and Y 3d_{5/2} spin orbit states. The two peaks at 159.3 and 157.6 eV resolved from Y³⁺ in the unannealed crystal shifted to 159.2 and 157.3 eV in the annealed sample (Figure S3). These results confirm that the Zr and Y valence state were not changed by annealing.

Citation: Wang, Y.; Zhu, Z.; Ta, S.; Cheng, Z.; Zhang, P.; Zeng, N.; Goodman, B.A.; Xu, S.; Deng, W. Optical Properties of Yttria-stabilized Zirconia Single Crystals Doped with Terbium Oxide. *Crystals* **2022**, *12*, 1081. <https://doi.org/10.3390/cryst12081081>

Academic Editor: Alessandro Chiasera

Received: 30 June 2022

Accepted: 29 July 2022

Published: 1 August 2022

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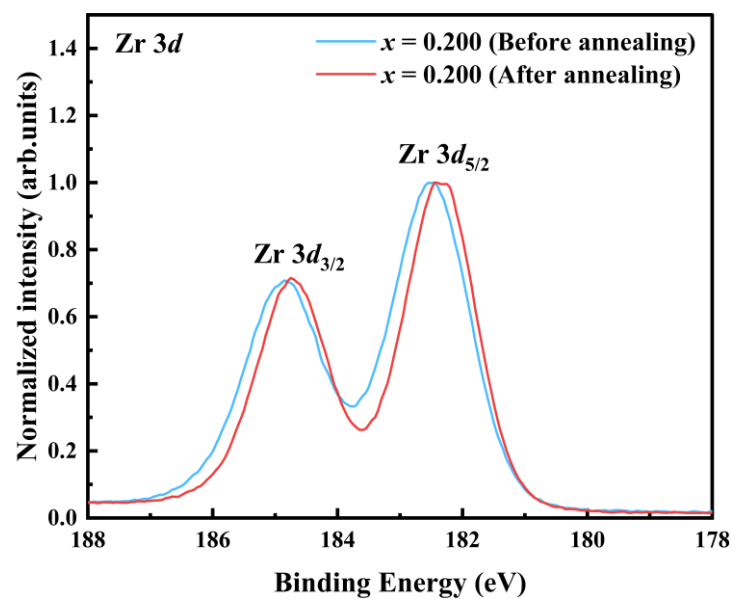


Figure S2. XPS Zr 3d core energy level spectrum of $(ZrO_2)_{92}(Y_2O_3)_{7.800}(Tb_4O_7)_{0.200}$ single crystals before and after annealing at 1500 °C in an H_2/Ar atmosphere;

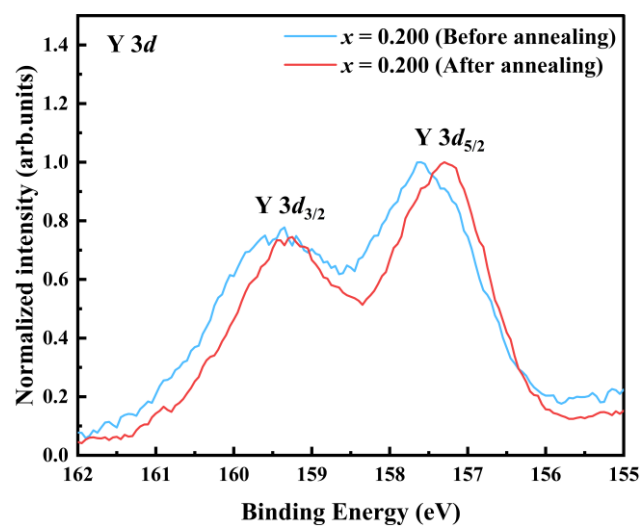


Figure S3. XPS Y 3d core energy level spectrum of $(ZrO_2)_{92}(Y_2O_3)_{7.800}(Tb_4O_7)_{0.200}$ single crystals before and after annealing at 1500 °C in an H_2/Ar atmosphere.