STRUCTURE REFINEMENT FOR Pr DOPED ZrO_2-Y_2O_3 NANOCRYSTALS

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X-ray diffraction study for Pr doped, yttria-stabilized zirconia (YSZ:Pr^{+3}) nanocrystals system is presented in this work. The interest with this material is connected with recently described luminescence [1]. Yttria-stabilized zirconia (YSZ), a material built mainly from high-symmetry crystals, is one of the most studied metal oxides. It is a relatively hard and chemically inert material. YSZ is characterized by wear resistance, high-temperature stability and corrosion resistance, superionic conductivity at high temperature. A special interest is connected with nanosized YSZ, and for which synthesis routes has been developed (see a brief review [2]).

The phase composition dependence on the Y_2O_3 content (up to 11.2% mol) and on heat treatment conditions (unannealed, annealed at 1200°C) was quantitatively determined for samples grown via a hydrothermal microwave-driven process, using the Rietveld method (an example in Fig. 1).

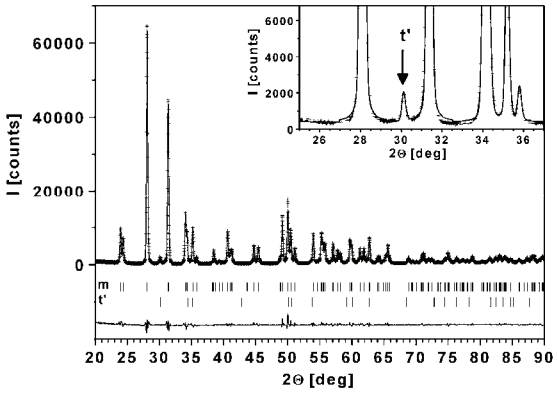

Fig. 1. Rietveld refinement plot of the annealed ZrO_2:Pr. The inset documents the presence of 101 reflection of tetragonal phase.

The changes in the structure, phase composition and crystallite size caused by the addition of yttria, Pr doping and annealing are discussed on the basis of reported data for undoped material [3–5]. A formation of high-symmetry (cubic, tetragonal) phases is observed for high yttria content, in agreement with general tendencies observed in literature for undoped samples. Annealing results in decrease of the high-symmetry phase contribution in favour of the lower symmetry phase and in increase of the crystallite size from 4-8 nm to ~35 nm for the main phases.

References

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