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Determination of particles size and dislocations density of nanoscale sample of CeO_2 by second- and fourth-order restricted moments using neutron diffraction

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Abstract: Diffraction line broadening analysis has been proved to be an extremely powerful method to study the defect properties of crystalline materials, since different types of defects produce different types of diffraction line profiles. In other word, the distribution of intensity, especially in tails of line profile, strongly depends on the crystallite size and dislocation structures. In this paper, we have applied the second and fourth order restricted moments methods and analysed the neutron diffraction data collected on Ceria in terms of crystallite size and dislocation density. The values of dislocations density and crystallite size obtained from the second-order restricted moment do not agree with those obtained from the fourth-order restricted moment. This discrepancy is not unexpected when size broadening can not be neglected, the second-order restricted moment does not give correct values for microstructure parameters and therefore these parameters must be evaluated from the fourth-order restricted moment.

Keywords: *Neutron diffraction, nanoscale sample, second-order restricted moment, fourth-order restricted moment.*

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