

Accepted Manuscript

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Ali Mokhtari, Vishtasb Soleimani, Hamed Aleebrahim Dehkordi, Kamran Dastafkan

PII: S0022-0248(17)30518-3

DOI: <http://dx.doi.org/10.1016/j.jcrysgro.2017.08.026>

Reference: CRY 24277

To appear in: *Journal of Crystal Growth*

Received Date: 6 December 2016

Accepted Date: 23 August 2017

Please cite this article as: A. Mokhtari, V. Soleimani, H.A. Dehkordi, K. Dastafkan, Applying the X-ray diffraction analysis for estimating the height and width of nanorods in low symmetry crystal multiphase materials, *Journal of Crystal Growth* (2017), doi: <http://dx.doi.org/10.1016/j.jcrysgro.2017.08.026>

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Applying the X-ray diffraction analysis for estimating the height and width of nanorods in low symmetry crystal multiphase materials

Ali Mokhtari^a, Vishtasb Soleimanian^a, Hamed Aleebrahim Dehkordi^a,
Kamran Dastafkan^b

^a*Department of Physics, Faculty of Sciences, Shahrekord University, P.O. Box 115, Shahrekord, Iran*

^b*Solid State Nanomaterials research group, Research Center for Nanotechnology, KAVA Research Institute (KRI), Tehran, Iran.*

Abstract

In this work the potential of Rietveld refinement procedure is used to study the shape and size of non-spherical nanocrystallites. The main advantages of this approach are that not only it can successfully extend to all nanomaterials with different crystal symmetries but also it can evaluate the various phases of multiple materials comparing to electron microscopy methods. Therefore, between seven crystal systems, the formulation of monoclinic and hexagonal crystals is developed. This procedure is applied for the mixture of sodium carbonate and zinc oxide nanocrystallites at different fractions of doped gadolinium oxide. It is found that the crystallites of sodium carbonate and zinc oxide have the rod and ellipsoidal shapes, respectively. The microstructure results are compared with the results of scanning electron microscopy imaging. Good agreement is achieved between the results of scanning electron microscopy and Rietveld methods.

Keywords: Nanorods, Rietveld refinement, Multi-phase materials, SEM, Low symmetry crystals

*Corresponding author

Email address: mokhtari@sci.sku.ac.ir (Ali Mokhtari)

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