

Accepted Manuscript

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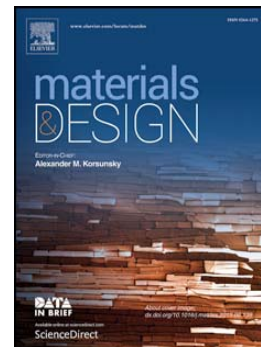
PII: S0264-1275(16)30029-6
DOI: doi: [10.1016/j.matdes.2016.01.029](https://doi.org/10.1016/j.matdes.2016.01.029)
Reference: JMADE 1230

To appear in:

Received date: 25 October 2015
Revised date: 3 January 2016
Accepted date: 7 January 2016

Please cite this article as: M. Sakar, S. Balakumar, P. Saravanan, Sellamuthu N. Jaisankar, Electric field induced formation of one-dimensional bismuth ferrite (BiFeO_3) nanostructures in electrospinning process, (2016), doi: [10.1016/j.matdes.2016.01.029](https://doi.org/10.1016/j.matdes.2016.01.029)

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Electric field induced formation of one-dimensional bismuth ferrite (BiFeO₃) nanostructures in electrospinning process

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Abstract

We report the characteristic influence of applied-voltage on the fabrication of one-dimensional fiber nanostructures of bismuth ferrite (BiFeO₃/BFO) in electrospinning process. The applied voltage of 8 kV is found to be the threshold voltage for the formation of BFO fibers. The further systematic variation of voltages such as 10 kV, 15 kV and 20 kV yielded smaller broken-fibers that appeared to be rod-like nanostructures, lengthy-ordered fibers, and belt-like nanostructures respectively. The crystal phase analysis by X-ray diffraction technique revealed the rhombohedral perovskite structure of BFO. The average diameter/thickness of rods, fibers and belts is estimated from their FESEM and HRTEM images and it found to be 90-150 nm, 100-200 nm and 100-150 nm respectively. The optical and magnetic studies by UV-visible spectrometer and SQUID magnetometer respectively revealed the dimension dependent optical properties, where their magnetic properties are found to be in the order of belts > rods > fibers > aggregated fibers. The formation of fibers is initiated with the evolution of electrified jet; where the variation in the applied voltage causes bending and whipping instability in the electrified jet that presumably determined the morphological and compositional structures of fibers.

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