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A.Talla, S. R. Dobson, Z. N. Urgessa and J. R. Botha

Department of Physics, Nelson Mandela University, P O Box 77000, Port Elizabeth, 6031, South Africa
s217063969@Mandela.ac.za

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Abstract

The growth of ZnO nanorods on a lattice mismatched substrate, using solution methods, typically results in a random orientation of the rods.. In this paper, the use of block copolymer films as a template for the oriented growth of ZnO nanorods is presented. These rods can be used for solar cells or as templates for the growth of TiO2 nanotubes.
Poly (styrene-block-methylmethacrylate) (PS-b-PMMA) has been investigated as a potential nano-mask for semiconductor growth. For this study, diblock copolymer thin films were spun onto a zinc oxide seed layer-coated silicon substrate and on an aluminium doped zinc oxide (AZO) substrate. Thermal annealing of PS-b-PMMA having an appropriate thin film thickness led to vertically oriented cylinders of PMMA within a PS matrix. Samples were then processed by wet etching in acetic acid after ultraviolet (UV) exposure of the polymer film at a specific dose.. This resulted in the removal of the PMMA cylindrical nano-domains from the polymer films„ leaving an array of ordered nanoscopic pores in which ZnO nanorods were subsequently grown. Samples were characterized using X-ray reflectometry to determine the thicknesses of the annealed PS-b-PMMA thin films. Scanning probe microscopy was used to view the phase morphology and characterize the selective removal of the PMMA. Scanning electron microscopy was used to view the zinc oxide rods grown on the polymer templates produced on the two different substrates.

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Prof J R Botha
Nelson Mandela University
reinhardt.botha@mandela.ac.za

Primary author: Mr TALLA, Assane (Nelson Mandela University)

Co-authors: Prof. BOTHA, Johannes Reinhardt (Nelson Mandela University); Mr DOBSON, Stephen (Nelson Mandela University); Dr URGESSA, Zelalem N. (Nelson Mandela University)

Presenter: Mr TALLA, Assane (Nelson Mandela University)

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