

Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Role of nitrogen dopants in the stabilization of nanocrystalline cubic zirconia RENAT SABIRIANOV, University of Nebraska at Omaha, G. WANG, Y.L. SOO, G. LUO, H.J. LIN, W.N. MEI, F. NAMAVAR, C.L. CHEUNG — The role of the nitrogen doping in the stabilizing the nanocrystalline cubic phase of zirconia films fabricated by nitrogen beam assisted deposition (IBAD) is investigated. The IBAD zirconia films have diameters three times larger than those previously reported in a sol-gel method. Confocal Raman spectroscopy study indicates that the atomic structure of these IBAD zirconia films evolve from cubic to tetragonal and then to monoclinic phase upon annealing at elevated temperatures. The presence of nitrogen in the films is confirmed by secondary ion mass spectroscopy. X-ray absorption near edge structure study of these films infers that the nitrogen atoms are incorporated at the substitutional sites of these films. Ab-initio density functional calculations suggests that the substitutional nitrogen atoms could effectively immobilize native defect including oxygen vacancies and interstitial ions in nanocrystalline cubic zirconia.

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Date submitted: 28 Nov 2010

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