

## Accepted Manuscript

Superconducting niobium nitride thin films by reactive pulsed laser deposition

Y. Ufuktepe, A.H. Farha, S.I. Kimura, T. Hajiri, K. Imura, M.A. Mamun, F. Karadag, A.A. Elmustafa, H.E. Elsayed-Ali

PII: S0040-6090(13)01350-3  
DOI: doi: [10.1016/j.tsf.2013.08.051](https://doi.org/10.1016/j.tsf.2013.08.051)  
Reference: TSF 32477

To appear in: *Thin Solid Films*

Received date: 20 June 2012  
Revised date: 18 April 2013  
Accepted date: 9 August 2013



Please cite this article as: Y. Ufuktepe, A.H. Farha, S.I. Kimura, T. Hajiri, K. Imura, M.A. Mamun, F. Karadag, A.A. Elmustafa, H.E. Elsayed-Ali, Superconducting niobium nitride thin films by reactive pulsed laser deposition, *Thin Solid Films* (2013), doi: [10.1016/j.tsf.2013.08.051](https://doi.org/10.1016/j.tsf.2013.08.051)

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

## Superconducting niobium nitride thin films by reactive pulsed laser deposition

Y. Ufuktepe<sup>1\*</sup>, A. H. Farha<sup>2,8</sup>, S. I. Kimura<sup>3,4</sup>, T. Hajiri<sup>3,5</sup>, K. Imura<sup>3,6</sup>, M. A. Mamun<sup>7</sup>, F. Karadag<sup>1</sup>, A. A. Elmustafa<sup>7</sup>, H. E. Elsayed-Ali<sup>2</sup>

<sup>1</sup>*Department of Physics, Cukurova University, Adana, 01330, TURKEY*

<sup>2</sup>*Department of Electrical and Computer Engineering and the Applied Research Center, Old Dominion University, Norfolk, Virginia 23529, USA*

<sup>3</sup>*UVSOR Facility, Institute for Molecular Science, Okazaki, 444-8585, JAPAN*

<sup>4</sup>*School of Physical Sciences, the Graduate University for Advanced Studies (SOKENDAI), Okazaki 444-8585, JAPAN*

<sup>5</sup>*Graduate School of Engineering, Nagoya University, Nagoya 464-8601, JAPAN*

<sup>6</sup>*Department of Physics, Nagoya University, Nagoya 464-8601, JAPAN*

<sup>7</sup>*Department of Mechanical and Aerospace Engineering and the Applied Research Center, Old Dominion University, Norfolk, Virginia 23529, USA*

<sup>8</sup>*Department of Physics, Faculty of Science, Ain Shams University, Cairo 11566, EGYPT*

### Abstract

The structural, electronic, and nanomechanical properties of cubic niobium nitride thin films were investigated. The films were deposited on Si(100) under different background nitrogen gas pressures (26.7-66.7 Pa) at constant substrate temperature of 800 °C by reactive pulsed laser deposition. Our results reveal that the NbN<sub>x</sub> films exhibit a cubic δ-NbN with strong (111) orientation and highly-oriented textured structures. We find nitrogen background pressure to be an important factor in determining the structure of the NbN<sub>x</sub> films. The dependence of the electronic structure as well as that of the superconducting transition temperature ( $T_c$ ) on the nitrogen gas background pressure is studied. A correlation between surface morphology, electronic and superconducting properties is found for the deposited NbN<sub>x</sub> thin films. The highly-textured δ-NbN films have a  $T_c$  up to 15.07 K. Nanoindentation with continuous stiffness method is used to evaluate the hardness and modulus of the NbN<sub>x</sub> thin films as a function of depth. The film deposited at nitrogen background pressure of 66.7

Download English Version:

<https://daneshyari.com/en/article/8036383>

Download Persian Version:

<https://daneshyari.com/article/8036383>

[Daneshyari.com](https://daneshyari.com)