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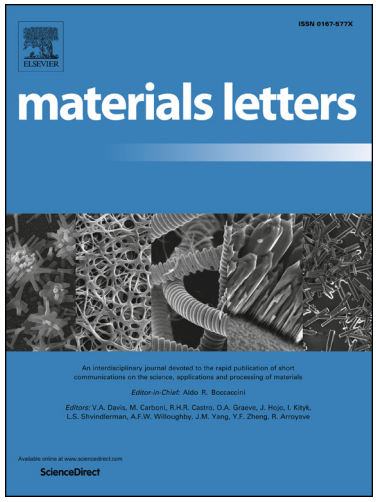

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Xianwei Hu, Zhiwei Tai, Chengtao Yang

PII: S0167-577X(17)31877-3
DOI: https://doi.org/10.1016/j.matlet.2017.12.111
Reference: MLBLUE 23609

To appear in: *Materials Letters*

Received Date: 26 October 2017
Revised Date: 22 December 2017
Accepted Date: 23 December 2017

Please cite this article as: X. Hu, Z. Tai, C. Yang, Preparation and characterization of Er-doped AlN films by RF magnetron sputtering, *Materials Letters* (2017), doi: https://doi.org/10.1016/j.matlet.2017.12.111

Preparation and characterization of Er-doped AlN films by RF magnetron sputtering

Xianwei Hu[a,b], Zhiwei Tai[a,b], Chengtao Yang[a,b,*]

a. State Key Laboratory of Electronic Thin Films and Integrated Devices, Chengdu, China, 610054.

b. University of Electronic Science and Technology of China, Chengdu, China, 610054.

*Email: ctyang@uestc.edu.cn

Abstract

Er-doped AlN thin films were deposited by RF magnetron sputtering on (0001) sapphire substrates under different temperature. We systematically investigate the influence of substrate temperature on the crystalline structure and the piezoelectric properties of the films. Consequently, the XRD intensity of (002) oriented peak first increases and then decreases with increasing substrate temperature, reaching a maximum value and a highly c-axis columnar crystal structure at 200℃. The piezoelectric constant d_{33} indicates a maximum value of 9.41pm/V at substrate temperature of 200℃. Due to Er doping in AlN films, an improvement in their crystalline structures and piezoelectric properties is noticed.

Keywords: Er-doped AlN, thin films, magnetron sputtering, substrate temperature, crystal structure, piezoelectric properties

1. Introduction

In recent years, surface acoustic wave (SAW) devices put higher demand on material properties. AlN thin film, with the peculiar combination of remarkable properties, has become a standard electronic material for most conventional MEMS devices, especially for high-temperature piezoelectric sensors and film bulk acoustic