

PO2032

## **Growth Morphology of AlN Thin Films Deposited by Reactive DC Magnetron Sputtering and its Influence on the Piezoelectric Properties**

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Aluminum nitride (AlN) is a piezoelectric material and is widely used in microelectronics, electroacoustic and optoelectronics. AlN thin films are commonly deposited by magnetron sputtering, which readily allows their integration into, for example, MEMS devices. Control of the microstructure and microchemistry is essential to achieve a good performance. In magnetron sputtering ions impacting on the growing film can be used favorably for this purpose. In this work we study the AlN thin film growth morphology and its correlation to piezoelectric properties under the influence of low energy ion bombardment.

Our setup includes an electromagnetic coil that allows varying the ion to neutral ratio by more than one order of magnitude. A change in the residual stress of AlN thin films from tensile to compressive is observed for an increasing ion flux. This goes along with a transition in the growth morphology from open grain boundaries towards dense films. The impact of these changes on the piezoelectric properties of AlN thin films is discussed and possible applications for scanning probe microscopy are presented.

### **Keywords**

Magnetron Sputtering

Thin Films

Aluminium Nitride

Magnetic Configuration

Piezoelectricity