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Aluminium nitride thin films deposited by DC and HiPIMS magnetron sputtering: structural analysis and piezoelectric response

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Aluminum nitride (AlN) is a material with application in a number of technological areas owing to its optical, dielectric and acoustic properties. Particularly, as a piezoelectric material with good dielectric properties, such as low losses, good high frequency characteristics, high velocity coupling coefficient, AlN film has received a great deal of attention for high frequency surface acoustic wave (SAW) device.

Many research groups have done a tremendous amount of research on AlN film growth in recent years. They mainly focused on the development of sophisticated film-synthesis techniques, controlling the preferred orientation by change of deposition parameters, and substantial improvement in the understanding of the related materials science. We have shown in some works that in condition to tune the deposition conditions, it is possible to improve significantly the crystalline quality of the films even if one use magnetron sputtering system at low temperature [1, 2].

Nevertheless, it has been observed that the good crystalline quality does not lead systematically to high piezoelectric performances. In the frame of this work, we have tried to address this question thanks to a large panel of structural analysis (XRD, MET, Raman, FTIR, ...) and piezoelectric investigations.

[1] C. Duquenne, M. A. Djouadi, P. Y. Tessier, P. Y. Jouan, M. P. Besland, C. Brylinski, R. Aubry, and S. Delage

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[2] C. Duquenne, P. Y. Tessier, M. P. Besland, B. Angleraud, P. Y. Jouan, R. Aubry, S. Delage, and M. A. Djouadi

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