

Structure and properties of AlN thin films deposited by pulsed laser deposition

**M. Trzyna¹, N. Berchenko¹, I. Virt³, W. Bochnowski², S. Adamiak², A. Dziedzic²,
R. Jakiela⁴, J. Cebulski²**

¹*Center for Microelectronics and Nanotechnology, University of Rzeszow, Pignia 1, 35-310 Rzeszow, Poland*

²*Center of Innovation & Knowledge Transfer, University of Rzeszow, Pignia 1, 35-310 Rzeszow, Poland*

³*Institute of Physics, University of Rzeszow, Pignia 1, 35-310 Rzeszow, Poland*

⁴*Institute of Physics, Polish Academy of Sciences, al. Lotników 32/46, 02-668 Warsaw, Poland*

Aluminium nitride (AlN) is characterized by high thermal conductivity, good temperature and chemical stability as well as good mechanical strength. In addition, AlN has piezoelectric properties and it is a wide bandgap semiconductor. Owing to that, it is more and more widely used in electronics and engineering for the fabrication of thermal sprayed coatings.

During the research, the composition and surface properties of aluminium nitride films deposited on silicon substrate Si (100) or the sapphire Al₂O₃ (0001) by pulsed laser deposition (PLD) were observed. Ablation was performed under high vacuum, using AlN target. Deposition parameters (pressure, temperature, purity of target) play an important role for mechanical and physicochemical properties, hence their proper characteristics are crucial to the manufacturing process. The films were characterized using time of flight secondary ion mass spectrometry (ToF-SIMS), confocal microscopy and AFM microscopy. Atomic force microscopy was used to obtain topography of semiconductor surface. Composition homogeneity as well as purity of AlN film was characterized by SIMS depth profiling of elements. These results confirm that films made by pulsed laser deposition of pure AlN have good prospects for microelectromechanical systems applications.