CIP 11

Abstract booklet

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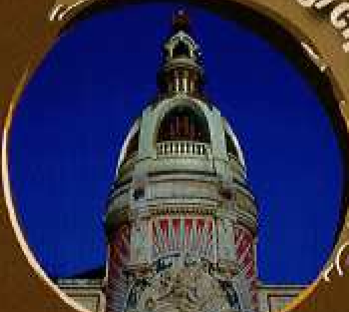

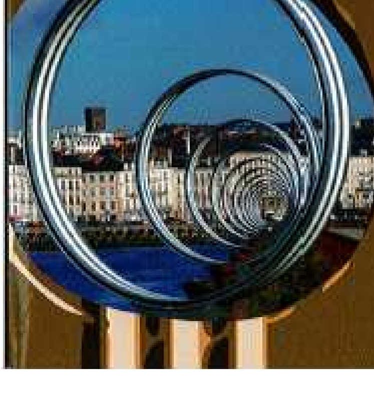

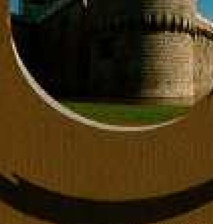

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ELECTRICAL PROPERTIES OF AlN_xO_y THIN FILMS DEPOSITED BY DC MAGNETRON SPUTTERING

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Aluminium oxide (Al_2O_3) is an insulator material, with high electrical breakdown, large band gap and high permittivity. Its dielectric properties make it a promising candidate to be used as gate material instead of SiO_2 in microelectronic applications, such as in flash memory circuits, organic thin film transistors (OTFT) and MOSFETs. On the other hand, aluminium nitride (AlN) is a ceramic piezoelectric material with high electrical resistivity and excellent thermal properties, which has been used in several applications such as substrate in microelectronic devices, fabrication of high power and high temperature electronic devices, surface acoustic wave (SAW) devices and electronic packaging. Combining both materials in the form of an oxynitride, AlN_xO_y, offers the possibility to synthesize a mixed system, in which several properties may be optimized, namely those related with the electrical response of the material. The use of aluminium oxynitride is not yet very common, despite some very few examples in the field of protective coatings, optoelectronics, microelectronics, and as a dielectric in multilayer capacitors.

Taking this as a starting point, the present work aims to study the variation of the electrical response of the AlN_xO_y thin films as a function of the composition of the prepared films, using as reference the two base binary systems: AlN_x and AlO_y. The films were deposited by DC magnetron sputtering, with the discharge parameters monitored during the deposition in order to control the chemical composition, according to the particular results of the electrical behavior. The electrical resistivity of the films, measure at room temperature, was found to depend strongly on film stoichiometry and crystalline structure. Furthermore, the electrical conductivity of the films measured as a function of the temperature changed gradually from metallic to semiconducting, which was correlated with the increase of the non-metallic/metallic ratio and the particular structural features that were observed by the XRD measurements. The overall set of results confirmed a smooth transition of the film's electrical characteristics between those of closely metallic (similar to the response of pure Al films), towards those of AlN and Al_2O_3 films.