Properties of Thin Metal Nitride Films Obtained by Laser Deposition

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Aluminium nitride, AlN, in known to be as a semiconductor with a large bandgap (6.2 eV) in its more stable wurtzite crystalline structure and reveals a refractive index of about 2.1-2.2 in the visible range. Exhibits high electrical resistivity, high hardness and it is also a piezoelectric material. AlN is commonly used in fabrication of optical sensors in the ultraviolet-visible region, light emitting diodes (LEDs) with one of the shortest emission wavelength reported (210 nm); and several types of microelectronic-related applications.

The thin films AlN were deposited by pulsed laser deposition, in a laboratory-sized deposition system. Structural details of the films were revealed by transmission electron microscopy TEM. Films for these investigations were deposited onto monocrystal Si substrates. Microhardness measurements were made with a PMT-3 tester equipped with a diamond Knoop pyramid. By applying increasing loads to the indenter it was possible to gather information on layer hardness at increasing penetration depths. Ten impressions were made at each load and the average microhardness values were. Another reason for the lower layer hardness could be the presence of a small oxygen amount in the films.

After annealing, the thickness of the individual layers is changed, and there is an increase in hardness. The best result is to strengthen the surface of the monocrystalline silicon obtained by applying aluminum nitride films: the rise of microhardness by 25% while maintaining the value of fracture toughness.

To study the optical properties of these coatings, some optical measurements (transmittance) were performed. It is thus possible to tune the films optical properties according to the application envisaged, by simply changing reactive gas flow during processing.

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2. Q. X. Guo, M. Yoshitugu, T. Tanaka, *Thin Solid Films*, **483(**1-2), (2005), 16.