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# Influence of surface energy on the microstructure evolution of AlN films synthesized by D.C magnetron sputtering

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The widespread technological application of nitride thin films is the reason for increasing interest in the investigation of these compounds. In particular AlN is an attractive material because of its high melting point, high thermal conductivity, extreme hardness, chemical and thermal stability, and high electrical resistivity et al.[1] AlN is an interesting optical film material with a high refractive index and low absorption. Its thin films are transparent in the visible, infrared and ultra-violet regions with high optical transmission between 0.2~12.5㎛.[2] It is also a promising material for optical applications in corrosive and high temperature environments.[3]

Recently, many studies have reported on AlN films deposited by a number of methods such as chemical vapor deposition, reactive sputtering, electron shower method, filtered arc deposition, laser ablation deposition, molecular beam epitaxy growth, and ion-beam-assisted deposition.[2,4,5,6] And though there are several works looking for the conditions, for example working temperature, $N_2$ gas flow rate, and power density et al, there are little works looking for the relationship between the surface energies of substrates and the microstructure evolutions of AlN films.[7,8]

In our work AlN films were deposited on the substrates with various surface energies (e.g glass, Si wafer, S45C and AISI H13 et al) by the D.C. reactive magnetron sputtering. The deposition rate, microstructure, surface morphology, microhardness, and adhesion of the films were studied using $\alpha$-step profilometer, XRD, AFM, micro knoop hardness tester, and scratch tester respectively.

[Reference]

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