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Reactive magnetron sputtering of scandium oxide films for various applications.

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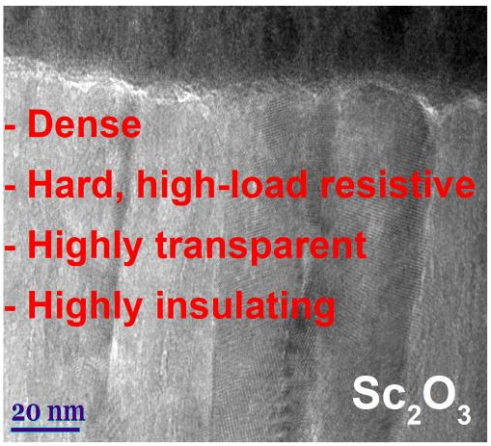

Firstly [1], the correlation between stoichiometry and properties of scandium oxide films prepared by reactive magnetron sputtering was investigated. The optimized deposition conditions were found. It was shown that the higher refractive index, the higher optical bandgap, and the lower extinction coefficient as stoichiometric films are concerned. It was found that films were with the cubic phase structure.

Secondly [2], the effect of annealing on structure, optical, mechanical and electrical properties of stoichiometric scandium oxide films (Sc_2O_3) was studied. It was found that annealing results in the decrease of extinction coefficient, and slightly decrease of the refractive index. It was shown, that by reactive magnetron sputtering it is possible to manufacture scandium oxide films with advanced mechanical properties. Both, as-deposited and annealed scandium oxide films can be characterized by the cubic phase, high hardness (up to 19 GPa) and resistance to high-load indentation (up to 1000 mN). Moreover, the electrical characterization of fabricated MIS structures with Sc_2O_3 as the gate-dielectric material revealed better electrical properties, such as lower frequency dispersion of C-V characteristics and lower effective charge values, as well as slightly higher electric field intensity that results in the dielectric layer's breakdown. The investigated dielectric films might be used as chemically stable, hard, resistive to cracking, highly transparent insulating films. The findings make the investigated scandium oxide films a promising material for various applications in optics, optoelectronic, and electronic semiconductor structures.

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