

## Effects of deposition parameters and oxygen addition on properties of sputtered indium tin oxide films = Efek parameter deposisi dan penambahan oksigen terhadap sifat-sifat lapisan tipis indium timah oksida hasil sputtering

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### Abstrak

Lapisan tipis indium timah oksida (ITO) dideposisikan pada substrat gelas corning dengan metode sputtering menggunakan gas argon. Parameter deposisi dan penambahan oksigen dalam gas sputtering dioptimasi untuk mendapatkan tingkat transparansi lapisan tertinggi dan resistivitas listrik terendah melalui pengamatan struktur, sifat listrik dan sifat optik. Peningkatan laju deposisi dan ketebalan lapisan menghasilkan perubahan orientasi kristalografi dari (222) ke (400) dan (440), serta peningkatan kekasaran permukaan lapisan. Pemanasan substrat sangat diperlukan untuk mendapatkan lapisan tipis dengan kristalinitas yang lebih baik. Nilai resistivitas lapisan cenderung naik dengan penambahan oksigen hingga 2% dalam gas sputtering, dengan nilai resistivitas terendah sebesar  $5.36 \times 10^{-4} \Omega \text{cm}$  dapat dicapai pada ketebalan lapisan 750 nm. Semua lapisan tipis yang dideposisi pada penelitian ini menunjukkan transparansi lebih dari 85% sehingga memungkinkan untuk diaplikasikan pada divais fotovoltaik dan display.

.....Indium tin oxide (ITO) films were sputtered on corning glass substrate. Oxygen admixture and sputtering deposition parameters were optimized to obtain the highest transparency as well as lowest resistivity. Structural, electrical and optical properties of the films were then examined. In creasing deposition rate and film thickness changed the crystallographic orientation from (222) to (400) and (440), as well as higher surface roughness. It was necessary to apply substrate heating during reposition to get films with better crystallinity. The lowest resistivity of  $5.36 \times 10^{-4} \Omega \text{cm}$  was obtained at 750 nm film thickness. The films resistivity was increased by addition of oxygen up to 2% in the argon sputtering gas. All films showed over 85% transmittance in the visible wavelength range, possible for applications in photovoltaic and display devices.