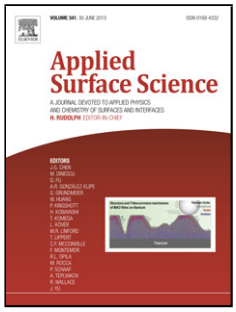


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# Surface characterization of low-temperature grown yttrium oxide

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Highlights

- ► Y foil oxidation at RT
- ► The O/Y AC ratio in the surface region of as-grown Y oxide was found to be 1.48
- ► Surface composition of Y oxide was found to be $Y_{0.383}O_{465}C_{0.152}$ before EPES analysis
- ► EPES IMFPs for $Y_{0.383}O_{465}C_{0.152}$ and $Y_2O_3$ compositions were fitted using Eq. (1)
- ► Measured IMFPs for both oxide compositions were found to be similar at E=0.5-2 keV.

**Abstract**

The step-by-step growth of yttrium oxide layer was controlled *in situ* using X-ray photoelectron spectroscopy (XPS). The O/Y atomic concentration (AC) ratio in the surface layer of finally oxidized Y substrate was found to be equal to 1.48. The as-grown yttrium oxide layers were then analyzed *ex situ* using combination of Auger electron spectroscopy (AES), elastic-peak electron spectroscopy (EPES) and scanning electron microscopy (SEM) in order to characterize their surface chemical composition, electron transport phenomena and surface morphology. Prior to EPES measurements, the Y oxide surface was pre-sputtered by 3 kV argon ions, and the resulting AES-derived composition was found to be $Y_{0.383}O_{0.465}C_{0.152}$ (O/Y AC ratio of 1.21). The SEM images revealed different surface morphology of sample before and after Ar sputtering. The oxide precipitates were observed on the top of un-sputtered Y oxide layer, whereas the oxide growth at the Ar ion-sputtered surface proceeded along defects lines normal to the layer plane. The inelastic mean free path (IMFP)