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Revising secondary electron yields of ion-sputtered metal oxides

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The emission of secondary electrons (SE) during sputtering of metal (Al, Mo, Nb, Pb, Ta, Ti, Zr, ...) foils by argon ions in an oxygen background has been measured in a particle beam reactor equipped with a SE-collector. This experiment mimics the process of reactive magnetron sputtering. Quantified beams of argon ions with energies between 500 eV and 2000eV were employed, while simultaneously molecular oxygen fluxes impinged on the surface and caused oxidation. For example, the measured secondary electron emission coefficients (γ) ranged from approximately 0.1 (for clean aluminium and titanium) to 1.2 and 0.6 (in the case of aluminium oxide and titanium oxide, respectively). The increase of γ is compared to SE measurements based on the modelling of magnetron plasmas. Moreover, the energy distributions of the emitted SE have been measured by varying the retarding potential of the SE-collector, which allows the monitoring of the oxidation state from the position of the Auger peaks. The origin of the observed SE yields based on the emission of low- and high-energy electrons generated on the oxide surface is discussed.

Keywords
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