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Nb and Nd-doped TiO2 films structural investigation by Auger Electron Spectroscopy

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Nanostructured titanium dioxide thin films have been widely investigated over the past decades owing to their outstanding physical and chemical properties and their relevance in many technological domains. On the other hand, intrinsic TiO_2-films show a relatively wide band gap (~3.2 eV) and high resistivity that significantly limit their application, especially as potential photocatalytic materials. Continuous efforts are therefore being undertaken to modify TiO_2 electronic and optical properties through the introduction of dopant ions into its lattice.
In this work, we have studied the chemical composition and the oxidation state of Ti, Nb and Nd in doped and undoped titania thin films using Auger electron spectroscopy (AES).
A comprehensive investigation of the surface, in fact, is important to understand the kinetic and thermodynamic characteristic of the films growth and to obtain information on its chemical and physical properties. This considering, in particular, that a large number of electronic properties of a material are closely related to its surface chemical composition, its atomic arrangement and its morphology.
Pure titanium dioxide, Nb-doped and Nd-doped TiO_2 thin films were deposited by RF co-sputtering at room temperature from pure TiO_2, metallic niobium and neodymium targets in Ar and Ar-O_2 atmosphere onto n-doped silicon substrates.
The Auger line shape, the intensity and the energy shift of the Auger fingerprints of the different elements have been investigated. Appropriate analytical conditions and diverse titanium oxides reference materials have been also used to evaluate and avoid the chemical changes of titanium oxide induced by electron irradiation.

Keywords
Titanium dioxide
Nd-doped
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