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# Structural, photoluminescent and photocatalytic properties of $\text{TiO}_2\text{:Eu}^{3+}$ coatings formed by plasma electrolytic oxidation

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## Abstract

In this paper, we used plasma electrolytic oxidation (PEO) of titanium in water solution containing 10 g/L  $\text{Na}_3\text{PO}_4 \cdot 12\text{H}_2\text{O}$  + 2 g/L  $\text{Eu}_2\text{O}_3$  powder for preparation of  $\text{TiO}_2\text{:Eu}^{3+}$  coatings. The surfaces of obtained coatings exhibit a typical PEO porous structure. The energy dispersive x-ray spectroscopy analysis showed that the coatings are mainly composed of Ti, O, P, and Eu; it is observed that Eu content in the coatings increases with PEO time. The x-ray diffraction analysis indicated that the coatings are crystallized and composed of anatase and rutile  $\text{TiO}_2$  phases, with anatase being the dominant one. X-ray photoelectron spectroscopy revealed that Ti 2p spin-orbit components of  $\text{TiO}_2\text{:Eu}^{3+}$  coatings are shifted towards higher binding energy, with respect to pure  $\text{TiO}_2$  coatings, suggesting that  $\text{Eu}^{3+}$  ions are incorporated into  $\text{TiO}_2$  lattice. Diffuse reflectance spectroscopy showed that  $\text{TiO}_2\text{:Eu}^{3+}$  coatings exhibit evident red shift with respect to the pure  $\text{TiO}_2$  coatings. Photoluminescence

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