

# Strong IR-visible erbium luminescence from the structure xerogel-mesoporous anodic alumina

I.S. Molchan<sup>a</sup>, N.V. Gaponenko<sup>a,\*</sup>, G.K. Maliarevich<sup>a</sup>, A. Podhorodecki<sup>b</sup>,  
R. Kudrawiec<sup>b</sup>, J. Misiewicz<sup>b</sup>

<sup>a</sup>*Belarusian State University of Informatics and Radioelectronics, P. Browki St. 6, 220013 Minsk, Belarus.*

<sup>b</sup>*Institute of Physics, Wrocław University of Technology, Wybrzeże Wyspińskiego 27, 50-370 Wrocław, Poland.*

---

Lanthanide-doped materials are of great attention in a wide application area due to strong emission in certain narrow ranges from ultraviolet (UV) to infra-red (IR). There was found from our recent investigations that the structures lanthanide-doped xerogel-porous anodic alumina (PAA) demonstrates strong photoluminescence (PL) due to multiple scattering of exciting light by porous matrix [1]. In this work, we report on strong PL in the IR and visible range from porous anodic alumina membrane infiltrated with Er-doped titania xerogel films. The argon laser operating at 300 and 514 nm was used as an excitation source. In IR range, strong PL was observed at 1.5  $\mu\text{m}$  and 980 nm. Moreover, the different ratio between intensities of these bands was revealed for different excitation wavelengths. The samples demonstrate strong green emission. The green PL is visible to a naked eye and originated from superimposing of intrinsic PAA PL at this range and Er bands centered at 520 and 550 nm and corresponding to  $^2\text{H}_{11/2} \rightarrow ^4\text{I}_{15/2}$  and  $^4\text{S}_{3/2} \rightarrow ^4\text{I}_{15/2}$  transitions in  $\text{Er}^{3+}$  ions. The origin of strong IR-visible PL is discussed. The developed structures are considered as a prospective candidate for application in light-emitting devices and microphotonics.

[1] N. V. Gaponenko, I. S. Molchan, S. V. Gaponenko, A. V. Mudryi, A. A. Lyutich, J. Misiewicz, R. Kudrawiec, *J. Appl. Spectroscopy* 70 (2003) 57-61.

---

---

\* Corresponding author.

*Email address:* nik@nano.bsuir.edu.by (N.V. Gaponenko).