

# **Luminescent materials based on semiconductor compound templates for random laser applications**

**Ursaki V. V., Tiginyanu I. M., Sirbu L., Enachi M.**

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## **Abstract**

A survey of methods for the preparation of luminescent nanocomposite materials with the focus on random laser media on the basis of porous semiconductor and dielectric templates is presented. Media with controlled light scattering properties are prepared by electrochemical dissolution of semiconductor substrates, or by electrochemical oxidation of metallic foils. For the introduction of optical gain properties to highly scattering medium prepared by electrochemical technologies, methods for doping porous semiconductor GaP, GaAs and InP as well as dielectric Al<sub>2</sub>O<sub>3</sub> and TiO<sub>2</sub> templates with rare earth elements (Eu, Er) and transition metals (Cr, Ti) were developed. The possibility of producing a medium with optical gain properties is demonstrated also by making use of excitonic effects such as exciton-exciton scattering and stimulated emission of electron-hole plasma. This approach is suitable for composite materials containing ZnO and ZnSe ingredients. A comparative analysis of the produced structures from the point of view of light emission efficiency, threshold for the onset of laser action, and other characteristics is presented.