LIQUID PHASE EPITAXY: A BENEFICIAL METHOD FOR DEVELOPMENT OF PHOSPHORS BASED ON SINGLE CRYSTALLINE FILMS OF OXIDE COMPOUNDS

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The report is dedicated to the achievements in the development of new type of phosphors based on the single crystalline films (SCF) of oxide compounds of different structural types (garnets, perovskites, sapphire) by the **liquid phase epitaxy (LPE)** method from super-cooling melt-solution in LOM, National University of Lviv.

The main fields of application of phosphors based on SCF of oxide compounds are considered in the **first** part of the report.

The second part of the report is addressed to the technology of LPE growth of SCF of garnets and perovskite compounds, doped with Ce^{3+} and Pr^{3+} activators, from the traditional $PbO\text{-}B_2O_3$ flux. The main conditions of the SCF crystallization are considered: 1) the boundary condition for mismatch between the lattice constant of SCF and substrate; 2) the respective choice of the content of melt–solution and optimization of Rare-Earth / Pb ratio in SCF; 3) the influence of lead ions on the light yield of SCF of garnets and perovskites.

The **third part** of the report contains new "hot" results related to using the lead-free $BaO\text{-}B_2O_3\text{-}BaF_2$ flux for crystallization of SCF based on the Ce^{3+}-doped garnet and perovskite compounds. Some advantages of SCF phosphors grown from BaO-based flux with respect to the SCF analogues grown from the traditional PbO-based flux are presented.

The **fourth part** of the report is concerned with the future development of SCF phosphors. The main attention is given to the development of UV–emitting SCF phosphors based on the garnets and perovskite compounds. For this purposes the three type of phosphors are considered: 1) Pr^{3+} doped SCF of garnets and perovskites; 2) SCF of garnet compounds doped with La^{3+} and Sc^{3+} isoelectronic impurities; 3) the novel UV phosphors based on Bi^{3+} activated SCF of oxide compounds, grown from the melt-solution based on Bi_2O_3 flux.

The possibility of the developed SCF of phosphors for luminescent transformers of LED radiation is also considered on the example of growth and investigation of SCF of $Tb_3Al_5O_{12}$ garnet, doped with Ce^{3+}, Ce^{3+}+Eu^{3+} and Mn^{2+} ions.

The differences in the luminescent properties of the phosphors based on single crystals and SCF of garnets and perovskites are shown in the **fifth part** of report. The reasons for such differences are determined. The peculiarities of Ce^{3+} luminescence and energy transfer in phosphors based on single crystals and SCF of garnets and perovskites are considered and advantages of SCF phosphors with respect to the single crystal analogues are evidenced.

In the **conclusions** of the report, it is summarized the wide possibilities related to the LPE technology for industrial applications, investigation of the fundamental optical properties of the developed oxides and teaching in universities and academy institutions.