

SURFACE MORPHOLOGY AND STRENGTH BEHAVIOUR OF VITREOUS FILMS DOPED BY NEODYMIUM

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The morphology and microstructure of silicophosphate films, undoped and doped by neodymium, were considered in the work. Strength characteristics (Young modulus and hardness) both the SiO₂-P₂O₅-Nd₂O₃ and SiO₂-P₂O₅ films under P_{max}=10 mN were also studied. In addition to that, the investigation of the soda-lime glass (SLG) substrate and as a whole of the composite structures SiO₂-P₂O₅-Nd₂O₃/SLG and SiO₂-P₂O₅/SLG (P_{max}=10, 100 and 900 mN) was carried out. A specific microstructure, composed of basic film on which the structural units of small dimensions, about 0.1-0.2 μm, quasi-uniformly distributed, together with roundly structural units from some to tens micrometers, was detected on the SiO₂-P₂O₅-Nd₂O₃ and SiO₂-P₂O₅ film surfaces. (Fig.1).

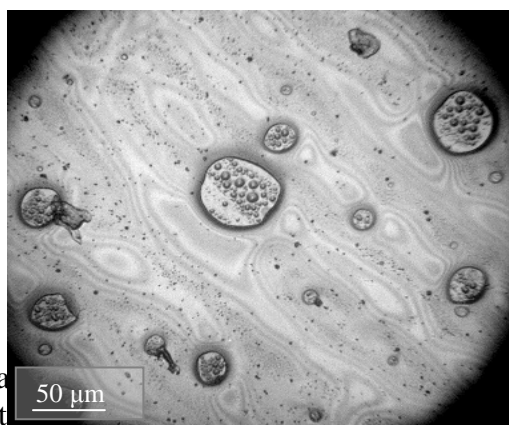


Fig.1. *Surface microstructure of the SiO₂-P₂O₅-Nd₂O₃ film deposited on surface of soda-lime glass (SLG)*

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Table. 1. Values of Young modulus (E) and hardness (H) of composite structures SiO₂-P₂O₅-Nd₂O₃/SLG, SiO₂-P₂O₅/SLG and substrate SLG

Nr.	Sample	Young modulus, E, GPa			Hardness, H, GPa		
		10 mN	100 mN	900 mN	10 mN	100 mN	900 mN
1	SiO ₂ -P ₂ O ₅ -Nd ₂ O ₃ /SLG	52±7,0	58,2±7,0	73,3±6,6	3,0±0,4	4,7±1,2	6,3±0,3
2	SiO ₂ -P ₂ O ₅ /SLG	55,4±3,3	46,3±4,2	39,6±1,9	3,9±0,9	4,1±0,4	4,4±0,4
3	SLG	70,8±5,2	65,3±3,1	62,3±4,0	7,8±0,4	6,2±0,4	5,4±0,3

The SiO₂-P₂O₅ films demonstrated quite good adhesive behavior. At the same time less cohesion strength 'film-substrate' was revealed for the composite structure SiO₂-P₂O₅-Nd₂O₃/SLG. A further research will be directed at the improvement of the adhesive behavior of structure under study.