that although we decomposed the broad bands into several Gaussian components, it is quite conceivable that a larger number of vibrational modes contribute to the overall spectrum. Compositional dependences of As–Se–S glasses Raman spectra indicate that intensity of the bands corresponding to molecular fragments with Se-related and homopolar As–As bonds increases with the growth of Se content. The intensity of the bands corresponding to the presence of AsS3/2 pyramidal units decreases with higher Se content. Thus, Raman data show that As–Se–S glasses contain different nanophases concentration of which is changing along chosen compositional cross-section.

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Synthesis and crystal structure of yttriumtrihydrogenphosphate $YH_3(PO_4)_2$

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Yttrium trihydrogen phosphate $YH_3(PO_4)_2$ belongs to a little-studied family, showing difficulties in the synthesis. Earlier [1], we reported the existence of $YH_3(PO_4)_2$. The aim of the present work was to elaborate synthesis technique, capable of ensuring the preparation of single-phase sample of $YH_3(PO_4)_2$, and to study its crystal structure.

Thin-layer technique (TLT), developed previously [1, 2] for investigation of phase equilibria in viscous hardly crystallizing systems containing volatile component, was used for preparation of $YH_3(PO_4)_2$. TLT provides the interaction of metal-carrier components with phosphoric acid in a layer of 2–5 mm thickness, enhancing dehydration of the solution and promoting quick attainment of the equilibrium without stirring. This method is a powerful tool, often providing successful synthesis of compounds when the use of common

preparative methods is failed. In the present work, $Y(NO_3)_3 \cdot 5H_2O$ was used as a metal-carrier for synthesis of $YH_3(PO_4)_2$.

The crystal structure of $YH_3(PO_4)_2$ was obtained from X-ray powder diffraction data at room temperature. The compound crystallizes in the monoclinic space group $P2_1/c$, with the unit cell dimensions a = 9.15098(7), b = 6.92314(7), c = 11.0867(1) Å, β = 102.0933(5)°. $YH_3(PO_4)_2$ was found to have a layered crystal structure, composed of metal-phosphate polymericlayers parallel with the *bc* plane (Fig. 1).

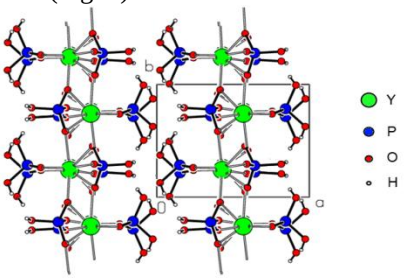

Fig. 1. Projection of the crystal structure of $YH_3(PO_4)_2$ along the *c* axis

In the polymeric layer, each yttrium atom is bonded to six neighboring yttrium atoms through the phosphate oxygen atoms (Fig. 2).

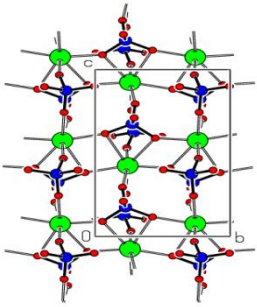

Fig. 2. Fragment of polymeric layer in the crystal structure of $YH_3(PO_4)_2$ viewed along the *a* axis (hydrogen atoms are omitted)

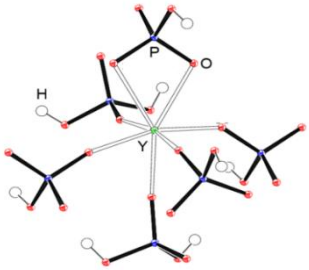

Fig. 3. Coordination environment of Y atom in the crystal structure of $YH_3(PO_4)_2$

Neighboring polymeric layers are connected by hydrogen bonds O–H···O of the hydroxyl H atoms to form a three-dimensional network. In the crystal structure of $YH_3(PO_4)_2$, each yttrium atom is surrounded by seven oxygen atoms, being bonded to five phosphate anions monodentately and to one anion bidentately. Coordination polyhedron of the yttrium atom can be considered as a distorted octahedron with a bifurcated vertex (Fig. 3). It should be noted that

crystal structures of $YH_3(PO_4)_2$ and earlier studied $YH_3(PO_4)_2 \cdot 0{,}5H_2O$ [3] have much in common.

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Chalcogenide glasses: advances in research and applications

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Chalcogenide glasses and films attract much attention due to their unique combination of properties: high transparency in the IR region, photoinduced change of properties (shift of the fundamental absorption edge, solubility changes, photoamorphization-photocrystallization, etc.), quasi-stability, ion-conductivity of doped chalcogenide glasses and films which serve as a base of their numerous applications. Chalcogenide glasses (CG) are widely used in versatile technological applications such as infrared optical elements, acousto-optic and all-optical switching devices, holography recording media, etc.

In present report the recent results of studies of chalcogenides glasses (CG), films and structures on their base are reviewed. Main attention is devoted to the investigations of nanocomposites on the base of chalcogenide glasses which provide possibility of direct relief formation and applications in optical elements fabrication, holography, etc. [1–3]. Structural properties of CG and films are discussed [2,4]. Direct surface patterning of materials (in our case composite nanomultilayer (NML) structures on the base of chalcogenide glasses) by a laser or electron beam without chemical etching, attracts high interest due to advantages like high flexibility and precision, moderate cost, and high rate. Nanomultilayer CG structures are simplest artificial nanostructures that can be rather easily fabricated with controlled geometrical parameters and investigated as thin films using vacuum evaporation technique.

Holographic recording properties of different types of NML structures on the base of chalcogenide glasses were analyzed. Optical parameters for NML integrally and constituent nanolayers are discussed on the base of single-oscillator model. Scalar and vector holographic methods were exploited for explanation of diffraction efficiencies dependencies. The studying of the diffraction efficiency vs. exposure dose shows the strong dependence of η on the