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Modification of Borophosphate Glass Composition for Joint Thermal Processing with Molybdenum Oxide for Development of Solar Cell Coatings

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Glasses based on borophosphate with the formula (45-0.5x)P2O5-xB2O3-10,0MoO3-(45-0.5x)Na2O where ⍰ = 20,0-60,0 have been manufactured using the melt-quenching methodology. Molybdenum oxide alone does not rank among glass-forming oxides, but it is able to enter the glass structure in the form of MoO4 tetrahedra or MoO6 octahedra with some glass-forming oxides, like P2O5. The regularities of phosphate-borate glasses modified with molybdenum(VI) oxide with the following composition: (45-0.5x)P2O5-xB2O3 -10.0MoO3 -(45-0.5x)Na2O (x = 20.0-60.0) have been carried out and it is shown that an increase in B2O3 concentration from 45 to 60% mol. is accompanied by an increase in the hygroscopicity of the obtained amorphous materials. To modify the optical properties of the glass, 10% mol of MoO3 has been added to its composition, because with a higher content of this modifier, oxidation-reduction processes Mo(VI)⟶ Mo(V) with loss of transparency of the resulting glass is expected.

In order to design luminescent coatings that effectively absorb in the UV region of the spectrum, an activator of 0.1% mol Eu2O3 was introduced into the composition of glasses (45-0.5x)P2O5-xB2O3 -10.0MoO3 -(45-0.5x)Na2O where x = 20-40. As a result of the study, it was found that under the condition of exposure of melts of the composition (44.95-0.5x)P2O5-xB2O3 -10.0MoO3 -(44.95-0.5x)Na2O - 0.1Eu2O3 (x = 20.0-60.0) solubility of europium oxide decreases with increasing B2O3 content.

The glassws has been characterized by IR and luminescence spectroscopy, diffuse reflectance spectroscopy and X-ray powder analysis. It is shown that glass 34.95P2O5 –20.0B2O3 -10.00MoO3 –34.95Na2O –0.1Eu2O3, which is effectively excited by UV radiation, is the most promising for modeling UV to visible light convertors.

Type of presence

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