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Structural changes in lead phosphate glasses doped with vanadyl

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A series of lead phosphate glasses doped with vanadyl were prepared by a single-step process from PbO and $NH_4H_2PO_4$. In these glasses, the transition metal ion as vanadyl VO^{2+} ion derived from $VOSO_4 5H_2O$ as VO^{2+} (VS) doped and VO^{2+}(VP) is used as another dopant derived from V_2O_5. A Thorough Knowledge of optical properties of transparent glasses will enable successful utilization of glasses for optical applications such as windows, filters and lasers. The optical absorption spectra of these glasses in the ultra-violet region have been recorded. The results obtained on the electronic absorption spectra observed to d-d bands. The VO^{2+} ions along with the double-bonded oxygen exist in a molecular complex which is identified as VO_5 polyhedra in lead phosphate glass network. As the PbO content in the glass increases, structural changes take place in the network. The IR spectra of these glasses were also presented with the results. The glass-modifying role of PbO is extendable up to 66.6 mole% with the glass former P_2O_5. The differences in the IR spectra of phosphate glasses of various compositions arise presumably from the chains being polymerized to different extents. The role of PbO as glass modifier is almost quantitatively determined by the amount of P_2O_5. The characteristic IR band due to the P=O bond in the P_2O_5 network is retained until the composition of pyro-phosphate quenched samples (x=0.66) suggests that PbO does not act as a "glass former" and no complete rupture of the glassy network by Pb^{2+} takes place.

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