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Synthesis, thermal characterization and structural study of glass in the (100-x)TeO₂-xPb(PO₃)₂ binary system

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Glass samples in the binary system (100-x)TeO₂-xPb(PO₃)₂ were prepared by the melt-quenching method with a glass-forming domain from x=5 to x=100. The samples were investigated by XRD, DSC, FTIR, Raman spectroscopy and ³¹P MAS NMR. With these characterizations, the structural evolution of glass samples with composition could be elucidated. The IR and Raman spectroscopy suggest a progressive incorporation of Pb(PO₃)₂ in the covalent network of TeO₂ with conversion of structural units TeO₄ to TeO₃. XRD results of the crystallized samples show the different crystalline phases: ?-TeO₂, Pb₂P₂O₇, Pb₃P₄O₁₃ and Pb(PO₃)₂. Finally, the proposed structural model provides a direct link between the microscopic properties (as structure and connectivity) with macroscopic properties (as T_g).