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Formation and Elastic Behavior of Lead-Magnesium Chlorophosphate Glasses

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Abstract: A series of ternary lead-magnesium chlorophosphate glasses, $(\text{PbCl}_2)_x(\text{MgO})_{1-x}(\text{P}_2\text{O}_5)_{0.4}$, of various compositions with $0.3 \leq x \leq 0.45$ have been successfully prepared and their elastic properties have been characterized at room temperature. Results from the studies show that both the longitudinal and shear wave velocities decrease with increase of PbCl_2 composition. The elastic constants C_{11} , C_{44} and Young's modulus show a decreasing trend while the elastic constant C_{12} , bulk modulus and Poisson's ratio show an increasing trend as the fraction of PbCl_2 increases. This behavior of the elastic properties is related to the change in the structure of glasses as well as the interatomic bonding.

Key Words: Chlorophosphate glasses, Wave velocities, Elastic constants

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