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Hot Compression of ZnO-P₂O₅ Glasses: Structure-Property Relations

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Knowledge of the response of structure and properties of P₂O₅-containing glasses to high pressure is limited. In the present study, we investigate the influence of hot isostatic compression on the structure, dynamics, density, and mechanical properties (hardness and crack resistance) of four zinc phosphate glasses with varying O/P ratio. The glasses are isostatically compressed at 1 and 2 GPa at the respective glass transition temperature, enabling permanent densification of bulk sample specimens. In as-prepared glasses, addition of ZnO modifies the phosphate network, thus increasing glass transition temperature and hardness. Upon compression, the glasses permanently densify leading to a further increase in hardness but decrease in crack resistance. We discuss these pressure-induced property changes in relation to the structural changes as measured through Raman and ³¹P NMR spectroscopy.