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Elastic properties of micrononhomogeneous As-S-Ge alloys

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Abstract

The chalcogenide alloys As-S-Ge have been prepared by a melt-quenching method and their density, microstructure and ultrasonic longitudinal sound velocity have been investigated at 15 MHz. The longitudinal modulus was calculated and its dependence on the composition and mean atomic coordination number, r, found. It is shown that, although the structural state of these materials is different, the sound velocity and longitudinal modulus vary rather monotonicly with composition. At the same time, a threshold of elastic properties about r = 2.7 was observed. The longitudinal moduli increase near this point from 150 to 600 kbar. With respect to Thorpe's theory, such transition can take place at r - 2.4, when a chalcogenide material turns from polymeric into solid state structure with its rigidity sharply increasing. The difference is explained by the influence of intermolecular and intercluster forces.