Structural transformations and anomalous viscosity behavior in oxide and chalcogenide melts under high pressure

V.V. Brazhkin

Institute for High Pressure Physics RAS, 142190 Troitsk Moscow region, Russia

We report several examples of anomalous behaviour of the viscosity vs pressure dependence associated with structural phase transformations in elementary liquids (Se), oxide melts (B_2O_3, P_2O_5) and chalcogenide liquids (AsS and As_2S_3). Phase transitions in liquids can lead to the drastic changes of the viscosity. During polymerization of AsS melt under pressure large viscosity increase is observed (from several Pa s to hundreds Pa s). During metallization of liquid Se, As_2S_3 and AsS the viscosities drop by several orders of magnitude (from 10000 Pa s up to 0.6 Pa s – for As_2S_3; up to 20 mPa s for AsS and up to 7 mPa s for Se). B_2O_3 melt exhibits record viscosity decrease under pressure from 3000 Pa s to 0.3 Pa s at 5.5 GPa simultaneously with the appearance of tetra-coordinated boron in the melt. The viscosity of P_2O_5 melt decreases from 5000 Pa s at normal pressure to 1-5 Pa s at 10 GPa. The structure changes in all melts are discussed. The importance of these viscosity changes for the material science and geophysics is mentioned.