

Melting, glass transformation and relaxation of inorganic glasses

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Abstract: Melting of chemically bonded solids is caused by electronic transitions. This has been concluded from an analysis of the enthalpy and the specific heat capacities of solids near their melting temperatures, T_m . Above T_m the electrons in their randomly changing excited states make the core ions relax to new places in a random time series. On cooling the melt below T_m the transitions of electrons to excited states are decreased and freezing occurs. If the forces of the electron distribution are not strong enough to shift the core ions to regular lattice sites the undercooled melt transforms to a glass. The shift of the electron distribution to lower energies depends on the temperature and the cooling rate near the glass transformation temperature T_g . It is shown that relaxation of many glass properties may occur due to the interaction or coupling of the electronic wave functions with the mean position of the core ions.

Keywords: inorganic glass; glass transformation; melting; relaxation of glasses