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Stretched Exponential relaxation in pure Se glass.[1] S DASH, S RAVINDREN, P BOOLCHAND, University of Cincinnati — A universal feature of glasses is the stretched exponential relaxation, f(t) = exp[-t/τ]$^{\beta}$. The model of diffusion of excitations to randomly distributed traps in a glass by Phillips[1] yields the stretched exponent β = d[d+2] where d, the effective dimensionality. We have measured the enthalpy of relaxation $\Delta H_{nr}(t_w)$ at T_g of Se glass in modulated DSC experiments as glasses age at 300K and find β = 0.43(2) for t_w in the 0 <t_w <8 months range. The observed β is in harmony with the trap model. The result is consistent with the growth of interchain structural correlations mediated by both long range (van der Waals forces) and short-range (covalent) interactions. A striking consequence of this relaxation is a narrowing of the glass transition width from 7.1C to 1.4C, and the ΔH_{nr} term increasing from 0.21 cal/gm to 0.92 cal/gm. In bulk Ge_xSe_{100-x} glasses as x increases to 20%, the length of the polymeric Se_n chains between the Ge-crosslinks decreases to n = 2. and the striking relaxation effects nearly vanish.

[1]J.C. Phillips, Rep.Prog.Phys. 59, 1133 (1996).
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