Fractional Viscosity Dependence of Reaction Kinetics in Glass-forming liquids SEULKI KWON, HYUN WOO CHO, JEONGMIN KIM, BONG JUNE SUNG, Department of Chemistry, Sogang University, Seoul 121-742, Republic of Korea — Dynamics of glass-forming systems has been extensively investigated due to its slow and heterogeneous dynamics. The diffusion of molecules in complex systems such as cell cytoplasm also exhibit dynamic heterogeneity and resembles that of glass-forming systems. Chemical reactions in such systems are, therefore, expected to be affected by dynamic heterogeneity and reaction kinetics would differ significantly from that in normal liquids. In this study, we investigate the kinetics of polymer loop formation in Kob-Andersen(KA) glass-forming liquid. The diffusion coefficient (D) of KA liquid deviates from Stokes-Einstein relation due to dynamic heterogeneity, i.e. D $\sim \eta^{-\xi}$ with $\xi = 0.85$ According to Kramers theory, reaction kinetics can be projected onto a one-dimensional reaction coordinate and may be described well by Brownian diffusion along the reaction coordinate. We find that the loop formation reaction faithfully follows Kramers theory, but the reaction viscosity (η_{rxn}) shows a fractional viscosity dependence, i.e. $\eta_{rxn} \sim \eta^{\xi}$ with $\xi = 0.85$, which is contrary to reactions in normal liquids where $\eta_{rxn} \sim \eta$.

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Date submitted: 10 Nov 2016   Electronic form version 1.4