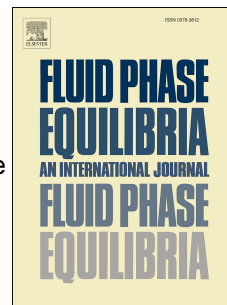


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Dynamics of a PEG Based Non-Ionic Deep Eutectic Solvent: Temperature DependenceKallol Mukherjee,¹ Ejaj Tarif,¹ Anjan Barman² and Ranjit Biswas^{1*}

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Abstract

Temperature dependent dynamics of a polyethylene glycol based non-ionic deep eutectic solvent (DES) has been investigated via both dielectric relaxation spectroscopic (DRS), and time-resolved fluorescence (TRF) Stokes shift and anisotropy measurements. The composition of the DES considered is as follows: $w[fCH_3CONH_2 + (1-f)NH_2CONH_2] + (1-w)PEG$, where w represents the weight fraction and f represents the mole fraction. In this investigation we have kept w fixed at 0.67 and f fixed at 0.6. Both DR and TRF measurements have been carried out within the temperature range, $308 \leq T(K) \leq 333$. DRS measurements have been performed within the frequency window, $0.2 \leq \nu/GHz \leq 50$. TRF measurements employ coumarin 153 (C153), a fluorescent probe molecule, as a local reporter. Interestingly, the estimated static dielectric constant (ϵ_0) for this DES is considerably large, even higher than the ϵ_0 value of polar solvents like, dimethyl formamide and acetonitrile. Measured DR spectra require four relaxation processes, spread over sub-10 ps to nanosecond time regime, to adequately describe the detected DR dynamics of this DES. Surprisingly, this non-ionic DES possesses a nanosecond relaxation component similar to that in ionic acetamide DESs. The presence of this slow relaxation component is further supported by the corresponding dynamic fluorescence Stokes shifts measurements. Both DR and dynamic fluorescence anisotropy data reveal substantial fractional viscosity dependence for solute rotation in this DES.

Keywords: Non-ionic DES, Acetamide, Urea, Polyethylene glycol (PEG), Dielectric relaxation, Time-resolved fluorescence measurements

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