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Comparative Study of the Intermolecular Dynamics and Physical Properties of Branched and Linear Alkyl Chain Imidazolium Ionic Liquids[1] LIANJIE XUE, FEHMI BARDAK, GEORGE TAMAS, ESHAN GURUNG, EDWARD QUITEVIS, Department of Chemistry & Biochemistry, Texas Tech University, Lubbock, TX 79409, YUNG KOH, SINDEE SIMON, Department of Chemical Engineering, Texas Tech University, Lubbock, TX 79409 — The optical Kerr effect (OKE) spectra, densities, viscosities, and transition temperatures of 1-alkyl-3-methylimidazolium bis{(trifluoromethane)sulfonyl}amide ionic liquids (ILs) with branched alkyl chains, -$C_{n-3}CH(CH_3)_2$ (branched ILs), were measured and compared to those with linear alkyl chains, -$C_{n-1}CH_3$ (linear ILs), for n = 3, 4, 5, 6 and 7. The results show that a branched IL has a higher viscosity and transition temperature T_g than the corresponding linear IL with the same n, whereas the densities of each branched/linear IL pair are the same within experimental error. For short alkyl chains (n=3 and 4) the intermolecular part of the OKE spectrum of the branched ILs tends to be narrower and lower in frequency than that of the linear ILs. This suggests that branching softens the intermolecular modes. For long alkyl chains (n=5-7), the difference between the intermolecular spectrum of the branched IL and that of the linear IL with the same n decreases, which indicates that the branching effect becomes smaller when the alkyl chains get longer.

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