

Abstract Submitted
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Spectroscopic Studies of Imidazolium and Pyridinium Based Ionic Liquids RYAN BOOTH, JAIME STEARNS, Air Force Research Laboratory — Ionic liquids (ILs) have been shown to be extremely useful in areas ranging from chemical synthesis to energetic materials. Furthermore, ILs are thought to be a potential replacement for hydrazine as satellite propellants because a subset are hypergolic with nitric acid. While ILs are useful, however, there is a lack of understanding of the microscopic origins for their macroscopic properties (e.g. viscosity). An example of this is that $[\text{emim}^+][\text{tf}_2\text{N}^-]$ is three times less viscous than its methylated counterpart $[\text{emmim}^+][\text{tf}_2\text{N}^-]$ and there is some discord regarding the reason. We have investigated the molecular properties of such IL pairs using UV and IR spectroscopy in the gas phase on both imidazolium and pyridinium-based ($[\text{pyr}^+]$) ILs. UV data show that the photophysics of $[\text{emmim}^+][\text{tf}_2\text{N}^-]$ is different than $[\text{emim}^+][\text{tf}_2\text{N}^-]$ in that there is a lack of evidence for the existence of a charge transfer (CT) state (as was seen in $[\text{emim}^+][\text{tf}_2\text{N}^-]$). Preliminary UV spectra for the $[\text{pyr}^+]$ ILs show at least two distinct peaks in the region from 208-270 nm, which are tentatively established as CT states between the anion and cation. IR spectra deliver structural information for both sets of ILs and should provide insight into the correlation between microscopic and macroscopic properties.

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