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Phase Changing Dicationic Polymeric Ionic Liquid with CO2 Capture Abilities

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Abstract : Polymeric ionic liquids combine the properties of ionic liquids and polymers into a single material which has gained massive interest in the recent years. These ionic liquids offer several advantages such as high phase change enthalpy, wide temperature range, chemical and thermal stability, non-volatility and the ability to make them task-specific. Separation of CO2 is an area of critical importance due to the concerns over greenhouse gasses leading to global warming. Thermal energy storage materials, also known as phase change materials absorb latent heat during fusion process and release the absorbed energy to the surrounding environment during crystallization. These materials retain this property over a number of cycles and therefore, are useful for bridging the gap between energy requirement and use. In an effort to develop materials, which will help in minimizing the growing energy demand and environmental concerns, a series of dicationic poly(ethylene glycol) based polymeric ionic liquids were synthesized. One part of an acrylate of poly(ethylene glycol) was reacted with imidazolium quarternizing agent and the second part was reacted with triazolium quarternizing agent. These two different monomers were then copolymerized to prepare dicationic polymeric ionic liquid. These materials were characterized for solid-liquid phase transition and the enthalpy by using differential scanning calorimetry. The CO2 capture studies were performed on a fabricated setup with varying pressure range from 1-20 atm. The findings regarding the prepared materials, having potential dual applications in the fields of thermal energy storage and CO2 capture, will be discussed in the presentation.

Keywords : CO2 capture, phase change materials, polyethylene glycol, polymeric ionic liquids, thermal energy storage
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