Synthesis of High Dielectric Constant Zwitterionic Liquids

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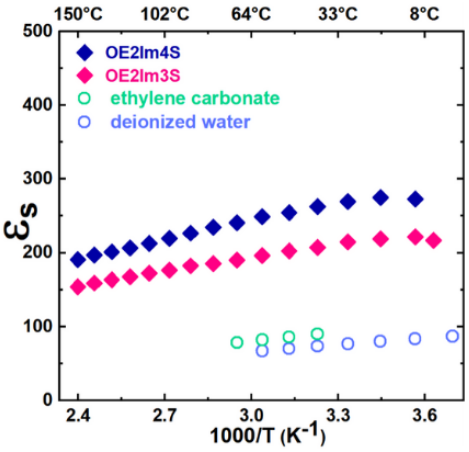

Temperature dependence of invention's dielectric constant

Technology Summary

These zwitterion compositions have exceptionally high εS from -20 to 120 oC. A two-step synthesis results in high purity zwitterions that form liquids at ambient temperatures with a low glass transition temperature. The synthesis allows for facile tailoring of cation-anion linkage lengths, which influences the dielectric constant. These high yield materials inhibit crystallization, which promotes homogeneous dispersion with soft materials. The inventors also have sterically shielded the cation and used charge-delocalized anions to increase molecular mobility and lower the melting point.

Application & Market Utility

High dielectric constant soft materials are important for applications such as soft robotics, electronics including actuators and energy storage devices such as batteries and capacitors. Developing materials with high dielectric constant (εS) is critical to improve the performance of these energy-related applications. Zwitterions are small molecules, in which a cation and an anion are connected via a linker bridge and coexist as one molecule. Most zwitterions do not show a large dielectric constants.

Next Steps

These shelf-stable, ultra-high dielectric constant materials have low flammability and volatility for improved safety. The inventors foresee commercial utility for many energy-related applications, such as non-volatile solid-state electrolytes for batteries, low-voltage actuators, and high-energy-density capacitors.

TECHNOLOGY READINESS LEVEL 4

Seeking

Licensing | Research

Keywords

- Ultra-High Dielectric Materials
- Capacitors
- Artificial Muscles
- Zwitterions
- Lithium-ion batteries

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