

Synthesis and modification of the structure of the ionic liquids to optimize their thermoelectric properties

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Ionic Liquids (IL) are organic salts with melting temperature typically below 100 °C. The unique properties of ionic liquids such as their excellent chemical and thermal stabilities (e.g. tetraethylammonium tetrafluoroborate can be heated up to 745°C [1].), their low vapor pressure, their important ionic conductivity makes them interesting compounds in material science and especially in thermoelectric generators (TEGs) for medical, pharma or electronic applications [2].

In our work, we describe the synthesis, physical, and thermo-electrochemical characterization of novel IL for application in thermoelectric generators (TEGs). We discuss the optimization of the chemical structure of IL regarding their thermoelectric properties via a structure-activity relationship approach [3]. The thermal stability of ionic liquids was investigated using thermogravimetric analysis in order to do a scale up of the synthesis of these ionic liquids.

[1] Park, D., et al., Thermal and Electrical Conduction of Single-crystal Bi₂Te₃ Nanostructures grown using a one step process. *Scientific Reports*, 2016. 6.

[2] Hapiot, P. and C. Lagrost, Electrochemical reactivity in room-temperature ionic liquids. *Chemical Reviews*, 2008. 108(7): p. 2238-2264.

[3] Siddique, T.A., et al., Synthesis and characterization of protic ionic liquids as thermoelectrochemical materials. *RSC Advances*, 2016. 6(22): p. 18266-18278.