For session on "Structure and Properties of Ionic Liquids and Molten Salts"

**Ionic Liquids, quasi-ionic liquids, and quasi-liquid ionics, all with high conductivities but some with little fluidity. Where does the paradigm end?**

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Ionic liquids (ILs) are interesting in electrochemistry mainly because of their ability to carry high ionic currents in two distinct cases: (i) for the aprotic class of ILs it is for current flow within a large window of electrochemical stability and hence the support a range of battery electrochemistries[1], and (ii) for the protic class of ILs (PILs) it is for their tunability within a very wide "acidity window"[2] and thereby support a range of fuel cell systems[3, 4]. For case (i), the stability window can extend to almost 6 volts (liquids), and much more at the oxidative end if the liquid has vitrified[5]. The protic ionic liquids are prepared by proton transfer from a Bronsted acid to a Bronsted base, and have been widely studied. Much less well-studied are the "halide-transfer" ionic liquids in which a halide ion is transferred from a halogenated molecular liquid to a strong Lewis acid, like AlCl₃[6, 7]. Where the proton transfer can be 100% complete in most cases, it is difficult to obtain 100% halide transfer. In some cases the conductivity is apparently much more complex in nature involving transient oxygen links to the Lewis acid[8]. This means that members of this class of ionic liquid tend to be of low ionicity relative to others examined on a Walden plot, although they can still be highly conducting due to their high fluidities. Finally we will discuss some new cases where the conductivity is liquid-like (10 mScm⁻¹), while the system formally has solidified. The cases of interest are those obtained from inorganic ionic liquids that have frozen only in the first stage where the centers of mass have become ordered but the rotational and positional order of alkali cations, remains liquid-like below 100ºC[9]. These have high potential for use in solid state batteries.