Ionic liquids (ILs) are low melting salts that are being designed, developed and explored for a myriad of energy and environmental applications. Even though they are liquids, they are salts with strong Coulombic forces between the cations and anions so they have extremely low vapor pressures. This means that they are not likely to contribute to air pollution. On the other hand, it is possible to make ILs that are highly toxic (and these should certainly be avoided). Nonetheless, their real potential for contributions to sustainability are the applications. Here we will explore how the unique properties of ILs – low vapor pressure, good thermal stability, widely tunable solvation properties and chemical functionalization – make previously inaccessible products and processes possible. Examples from our research at the University of Notre Dame include low energy separation of carbon dioxide from post-combustion flue gas, elimination of ozone depleting, global warming and flammable refrigerants, safer batteries and supercapacitors, and chrome plating without exposure to highly toxic hexavalent chromium.

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