CLAIMS

1. A solid, semicrystalline, ionically conductive, polymer material comprising:

a plurality of monomers; and

a plurality of charge transfer complexes,

wherein each of the plurality of charge transfer complexes is positioned on the plurality of monomers in the material thereby creating an ionic conduction mechanism for ionic mobility through the solid, semicrystalline, ionically conductive, polymer material, wherein the material is a solid electrolyte which does not rely on a solvent, liquid or gel phase for ionic conductivity,

wherein each of the plurality of charge transfer complexes is formed by a reaction of a base polymer, an ionic compound and an electron acceptor, the base polymer is a polyether ether ketone, polyphenylene sulfide, a liquid crystal polymer, or a semi-crystalline polymer with a crystallinity index greater than 30%, the ionic compound is an oxide, hydroxide or a salt, and the electron acceptor is 2,3-dichloro-5,6-dicyano-1,4-benzoquinone, tetracyano-ethylene or chloranil, and

wherein the ionic conductivity of the material is greater than 1.0×10^{-4} S/cm at room temperature.

2. The material of claim 1, wherein the crystallinity of the material is greater than 30%.

3. The material of claim 1, wherein the melting temperature of the base polymer is greater than 250°C.

4. The material of claim 1, wherein the reaction of the base polymer, the ionic compound, and the electron acceptor produces a cationic diffusing ion and an anionic diffusing ion.

5. The material of claim 4, wherein the cationic diffusing ion comprises lithium.

6. The material of claim 4, wherein the cationic diffusing ion is a monovalent ion.

7. The material of claim 4, wherein the anionic diffusing ion is a hydroxyl ion.

8. The material of claim 4, wherein the anionic diffusing ion is a monovalent ion.

9. The material of claim 4, wherein the anionic diffusing ion is a monovalent ion and the cationic diffusing ion is a monovalent ion at the room temperature.

10. The material of claim 1, wherein a molecular weight of the plurality of monomers is greater than 100 grams/mole.

11. The material of claim 1, wherein the material is hydrophilic.

12. The material of claim 1, wherein the ionic conductivity of the material is isotropic.

13. The material of claim 1, wherein the material in non-flammable by UL94-V0 standards.

14. The material of claim 1, wherein the material is in the shape of a film.

15. The material of claim 1, wherein the material is formed by doping with the electron acceptor.