

Polymer Electrolytes for Thin-Film Transistors

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Ionic liquids consisting of low molar mass cations and anions have been attracted great attention as electrolytes for electrical and electrochemical devices, and energy storage applications due to their negligible vapor pressure, thermal, chemical, and electrochemical stability, and high capacitance and ionic conductivity. In order to harness these outstanding properties noted above in a solid film, we have added a structuring polymer in the liquid to form a network. The polymer network can be designed by using copolymers which are partially compatible with ionic liquids. The resulting solid polymer gel electrolyte is referred to as an ion gel. The ion gel has been employed in thin film transistors as a gate dielectric because of its large capacitance value coming from nm thin electrical double layers at the electrolyte/electrode interfaces. To incorporate an ion gel layer on a device, three processes are used including lamination, transfer printing and aerosol printing. By using ion gels, low voltage operation of transistors is achieved ($< 2V$), which is feasible for portable and wireless devices.