

### Cycling Performance and Thermal Stability of Lithium-Ion Polymer Cells assembled with Gel Polymer Electrolyte containing Ionic Liquid

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Lithium-ion batteries have rapidly dominated the power-source market for portable electronic devices, power tools and electric vehicles due to their high energy density and excellent cycle life. However, safety issues surrounding these batteries must be addressed before they can be widely utilized in large-scale cells, since highly flammable organic solvents are major causes of fire and explosion in case of short circuit or local overheating. In the quest for a non-flammable electrolyte system, ionic liquids (ILs) have been extensively studied and recognized as one of the safest electrolytes for use in lithium batteries. They have attractive properties such as a negligible vapor pressure, low flammability, wide electrochemical stability, high ionic conductivity and high thermal stability. With the goal of developing IL-based electrolytes compatible for graphitized anode and  $\text{LiCoO}_2$  cathode, a mixed electrolyte composed of IL and organic solution has been investigated. An addition of IL into the organic electrolyte solution was proven to improve the thermal stability and reduce the flammability of electrolyte solution. With these mixed electrolytes, we assembled lithium-ion cells composed of a carbon anode and a  $\text{LiCoO}_2$  cathode, and their cycling performances were evaluated.