Thermal Investigations of Lithium-Conducting Gel-Polymer Electrolytes

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Lithium-conducting gel-polymer electrolytes have been proposed for replacing liquid electrolytes in lithium-ion batteries. With respect to liquid electrolytes supported in inert matrices, such as porous polyethylene and poly(vyniledene-fluoride) (PVDF), gel-polymer electrolytes in which the liquid solvent interact with the polymer may result in a low vapor pressure and the absence of leakage. In addition, the same polymer can be used as binder for the electrodes allowing the realization of monolithic cells that strongly simplify the battery assembly and hardware. For example, the gel-polymer electrolyte can be formed by thermal cross-linking of the polymer *in situ* (in the cell). Alternatively, thermopolymers can be used in the electrodes and electrolyte and the battery components hot laminated before forming the gel which can then be done by dipping the entire cell in the appropriate liquid electrolyte.

However, only a few reports have appeared on the investigation of the interactions occurring among the polymer and the solvent in a gel-polymer electrolyte. In order to address this issue we have performed the thermal characterization of a true gel-polymer system composed of PEO, EC-PC (1:1 mol), and LiBETI. For comparison purposes, the investigation has also been performed on the liquid mixture (EC-PC) and on the PEO-EC-PC system.

The thermal investigation of the PEO-based gel-polymer electrolytes has shown that only a fraction of the solvent in the gel-polymer electrolyte interacts strongly with to the polymer and the salt while most of it evaporates as a pure liquid.

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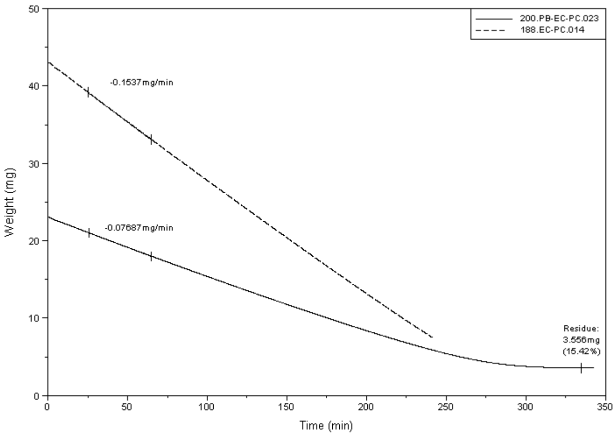

Figure 1. TG curves of EC-PC mixture and P(EO)20 LiBETI-EC-PC.