Lithium secondary batteries are divided into lithium ion (Li-ion) battery and lithium polymer battery. Li-ion battery uses a liquid electrolyte, so it has inherent problems like leakage of electrolyte. Recently, polymer electrolytes are studied to develop technology of lithium polymer batteries and enhance the safety of Li-ion battery. Among the various types of polymer electrolytes, the gel polymer electrolyte (GPE) has better ionic conductivity with relatively good mechanical properties even at room temperature because of the inclusion of a higher amount of the organic electrolyte in the polymer host. A GPE is usually made from a polymer host, a salt and a solvent or mixture of solvents. Poly(ethylene oxide) (PEO), poly(ethylene glycol) (PEG), poly(vinylidene fluoride) (PVdF), poly(vinylidene fluoride-co-hexafluoropropylene) [P(VdF-HFP)], and polyacrylonitrile (PAN) are widely used as the polymer host for GPEs.

In this work, the membranes for GPEs were prepared by blending PAN with trimethylolpropane triacrylate (TMPTA), which is used to make crosslinking of fibers and improve the mechanical strength. The mixture was electrospun and then crosslinked at 100 °C for 3 h using azobisisobutyronitrile (AIBN) as initiator. The resultant polymer membranes were soaked in an electrolyte solution to obtain the GPEs. The physical and electrochemical characteristics of the GPEs were studied in detail. By adding TMPTA and crosslinking of fibers, the tensile strength of GPE is improved, showing great potential for application in lithium batteries.