

## A method of preparing a gel type polymer electrolyte for a lithium-sulphur battery

### Development status

#### Phase 1

**Basic research.** A pure research based on the already observed and published facts.

### IP protection status

Patent CZ 308295

### Partnering strategy

*Collaboration, licensing*

### Institution



**Tomas Bata University in Zlín**

### Challenge

The use of Lithium-sulfur (Li-S) batteries is still growing in the world. However, current batteries show deficiencies in impregnation with a non-aqueous solution that contains an electrolytic salt. For this reason, we focused on a formulation without any solvents in the photo-initiated cross-linking reaction, which makes it possible to prepare gel polymers that are environmentally friendly. In addition, the use of simple devices and undemanding operating conditions translates into low production costs.

### Description

In a new method of preparing a polymer electrolyte, a film of polyethylene glycol dimethacrylate and butyl methacrylate is prepared by a photo-initiated cross-linking reaction and then dipped in an electrolytic solution of bis-trifluoromethane sulfonimide lithium salt in a mixture of solvents. Before mixing both components of the crosslinking reaction with the photoinitiator, nanoparticles of silicon dioxide are dispersed in butyl methacrylate. The main benefit of the composite gel polymer electrolyte with ceramic filler is the suppression of dendrite growth at the electrolyte/electrode interface during cycling. Compared to conventional polymer electrolytes with conductivity from  $10^{-5}$  to  $10^{-4}$  S.cm<sup>-1</sup>, the gel polymer electrolyte prepared by the new method at 25 °C has a conductivity greater than  $1 \times 10^{-3}$  S.cm<sup>-1</sup>.

### Commercial opportunity

The new method of preparing a gel-type polymer electrolyte is intended for use by manufacturers of Li-S batteries.