Mini Review

Review of poly (methyl methacrylate) based polymer electrolytes in solid-state supercapacitors

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Solid polymer electrolytes (SPEs) have been used as a promising electrolyte for supercapacitors due to their high processing flexibility and electrode–electrolyte interaction. Poly (methyl methacrylate) (PMMA)-based SPEs have received considerable interest due to their ease of synthesis, low mass density, strong mechanical stability, low binding energy with ionic salts, and excellent charge carrier mobility. In order to overcome the low room-temperature ionic conductivity and poor thermodynamic stability in high-voltage devices (> 4.2 V) of the PMMA materials, composition modulations incorporating PMMA with ionic liquids have been designed, which could effectively enable the applications of PMMA-based SPEs with widened electro-stable voltage ranges. In this review, we explain the fundamental physical properties of PMMA as a suitable polymer host in SPEs, as well as numerous modifications to overcome its brittleness. Some explanation of the types of polymerisation reactions is discussed and the free radical polymerisation of methyl methacrylate in ionic liquid is specifically reviewed. Further advancements and enhancements to PMMA-based materials for building of improved supercapacitors were also revealed.

Keywords: solid-state polymer electrolytes; poly (methyl methacrylate); supercapacitors; ionic conductivity; electrochemical stability.

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