3D Printed PEI Film for Hostile Environmental Conditions for Hygrothermal and Electrochemical Application

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As the storage capacity and charge-discharge performance of the rechargeable batteries have been increased substantially, the hygrothermal and electrochemical utilization conditions are so hostile that most conventional sealing materials cannot withstand in long-term operation. Polyetherimide (PEI), which consists of imide rings, is considered as one of the candidate polymers that can be used in such harsh conditions requiring outstanding hygrothermal and electrochemical stabilities. We adopted the solution-based printing method for PEI film in order to control the structural integrity in terms of film thickness, surface roughness, printed resolution, etc. using its low-energy processing characteristics. Dissolving PEI in N-methylpyrrolidone (NMP), the developed NMP/PEI ink was printed on the glass substrate using automated dispensing system. After heating the printed pattern at 100 °C for 2 hours, the PEI film was obtained over thickness 45 μm. The printed PEI film exhibited the anisotropic tensile strength(107 MPa for longitudinal and 97 MPa for transversal direction), Young's modulus(3.46 GPa), and dielectric constant(2.65) values comparable to commercial PEI film.