PSW6 : 차세대이차전지기술 연구회

PSW6-1 | Application of a new binder and dry coating processes for the next-generation high-energy-density thick electrode

SEONGBIN Jang[1], *JAEGEUN Lee[2], *JINSOO Kim[1]
[1]Korea Institute of Energy Research, [2]Pusan National University

Thick electrodes are increasingly recognized as a pivotal innovation in next-generation battery technology, offering superior energy density and cost-efficiency by minimizing inactive components within the cell assembly. However, traditional wet coating methods for electrode fabrication suffer from energy inefficiency due to solvent evaporation and exhibit compositional inhomogeneity owing to the migration of carbon and binder within the slurry. Such limitations compromise the interfacial bonding between the electrode materials, posing significant challenges to achieving and maintaining performance at elevated electrode loadings. This study introduces a novel binder and composite cathode engineered explicitly for a solvent-free dry coating process. Utilizing this approach, we successfully fabricated thick electrodes with uniform composition, achieving an electrode loading of 80 mg/cm2 and an areal capacity exceeding 12 mAh/cm2 at a discharge rate of 0.2 C. These findings offer valuable insights into the potential of dry coating techniques for developing high-energy-density thick electrodes.

PSW6-2 | Fabrication of three dimensional hollow-ball structured carbon nanofiber felt (3D-CNF) for Lithium-ion energy storage applications

*한희[1], 김미리[2], 김영태[3], 조수호[1], 이용희[1], 안치원[1]
[1]나노종합기술원, [2]목원대학교, [3]충남대학교

Lithium ion capacitor (LIC) has been regarded as a promising device to combine the merits of lithium ion batteries and supercapacitors, which can meet the requirements for both high energy density and high power density. Herein, we demonstrate a novel LIC electrode of three dimensional hallow-ball structured carbon nanofiber felt (3D-CNF) with high degree of graphitization. Electrospinning of polymeric solution containing SiO2 particles is employed to prepare ball embedded one dimensional nanofibers. The hollow balls consist of 10~20nm thick skin region surrounding SiO2 particles and contributed to the improvement of graphitization of CNF. Chemical activation enlarges the specific surface area by producing rich mesopores and macropores. It was found that electrochemical performances improved as the amount of SiO2 particles increased due to the increased surface area and improved degree of graphitization. Half-cell evaluation of the as-prepared 3D-CNF electrode sample shows a discharge capacity of 626 mAh/g at 0.1 A/g within 0.01~2.5 V and no distinct capacity fading until 600 cycles at 1 A/g, which is significantly higher than conventional activated carbon(120 mAh/g). Furthermore, 3D-CNF shows a superior energy density of 468 Wh/kg at a specific power of 3,375 W/kg, and remains 251 Wh/kg at 36,175 W/kg.