Synergistic effect of dispersant and wetting reagent on wettability, thermal Stability and electrochemical properties of PVDF-coating polyethylene separator for lithium-ion batteries

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Aim to improve the physical and related electrochemical properties of surface-coating separator, in this article, two kinds of dispersant and four kinds of wetting reagent were utilized to investigate their synergistic effect on the PVDF-coated polyethylene (PE) separator. After characterized with contact angle, slurry viscosity, electrolyte uptake ability and high-temperature baking, the PVDF-coating PE separator prepared under assistance of perfluorinated octylic acid sodium as dispersant and ethylene bis stearic acid amide as wetting reagent was assembled into MCMB//Li asymmetric battery. The results show that the PVDF-coating PE separator possesses reduced contact angle, improved electrolyte uptake ability and enhanced thermal shrinkage stability. Furthermore, the assembled battery with PVDF-coating PE separator can provide 304.2 mAh g⁻¹ of specific capacity with capacity retention reaching 93.2% after 50 cycles at 0.5C. The rate-recovering efficiency can back up to 95.1% at 0.1C after cycling at various rates. In comparison with bare PE, the battery with PVDF-coating PE separator demonstrates improved rate property and enhanced cycling stability. Even after 60% over-charging for 20 cycles at 0.2C, the battery with optimal condition separator can possess 84.9% of its initial specific capacity at 0.1C, strongly proven the superior over-charging tolerance. The synergistic effect between dispersant and wetting reagent can be utilized efficiently in preparation of high-quality separator for lithium ion batteries.

Keyword: Synergistic effect; Separator; Electrochemical properties; Lithium ion batteries.

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