Heat-resistive co-polyimide cathode binder for lithium-ion battery

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Lithium-ion batteries (LIBs) have been widely used for mobile IT devices and various electric vehicles (xEVs). Especially, since large-format LIBs are operated in the severe environments like -30 or 60 ^{o}C, their electrochemical performances and safety should be secured for at least 10 years. Recently, Yoon et al. reported that the degradation was closely related to the contact loss at the electrode/current collector interface and between active material particles [1]. Thus, the dimensional stability of electrode should be maintained even at high temperatures.

In this study, a co-polyimide (PI), which has a good thermal stability [2], is newly introduced as a cathode binder. The cathode consists of 90 wt.% active material (LiCoO2, KD-10, Umicore, Korea), 5 wt.% electronic conductor (Super-P, TIMCAL, Switzerland) and 5 wt.% polymeric binder (polyvinylidene fluoride (PVdF) and PI), in which the polymeric binders (PVdF/PI) are controlled to 10/0, 9/1 and, 0/10 (by wt. ratio). 2032 coin half cells are used to evaluate cycle life at 60 ^{o}C, and capacity retention behavior is also investigated after 10-day storage at the same temperature. In addition, the morphological changes and cell resistances are characterized by SEM and electrochemical impedance spectroscopy.

References

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