

Continuous kneading process for Lithium-ion Battery Electrode Slurries using Twin Screw Kneader, KRC Kneader

*Yukiko Fujita, Yuki Miura, Kazunori Fukumoto, Hajime Agata, Takehisa Fukui,
KURIMOTO,LTD., 2-8-45 Shibatani, Suminoe-ku, Osaka 559-0021*

As of now, the batch mixer is used as conventional process for slurry mixing mainly. However, the problems of conventional process are required for a long time to produce dispersed slurries, equipment occupied large footprint and inconsistent slurry characteristics. In addition, it might difficult to make an adequate slurries by using the next generation materials. More effective process is expected not only for producing new materials but also for applying to the large capacity application such as cars, energy storages and so on in the near future, but these issues have been little investigated.

In order to solve these demands, we have developed the continuous process for producing excellent dispersed battery slurry with using our continuous kneader, KRC Kneader. KRC Kneader is one of our flagship machinery and has already supplied more than 2,000 units in the various fields such as chemical, food, inorganic market. KRC Kneader has a horizontal twin shaft, co-rotating, and enclosed type. Paddles can be freely interchanged one by one, thus enabling the selection of a paddle pattern according to intended use and purpose. This mechanism achieves excellent mixing and dispersion capability.

In this study, $\text{Li}(\text{Ni}_{1/3}\text{Mn}_{1/3}\text{Co}_{1/3})\text{O}_2$ (NMC) or LiFePO_4 (LFP) is used as a cathode active material for the electrode, and the slurries were prepared by the continuous process. Several elements of conditions have beneficial effect on slurry viscosity and battery performance in each case.

As the results, we could get the suitable slurries for LIB by means of optimizing the kneading conditions. These obtained slurries were coated on aluminum foil and evaluated dispersion condition by scanning electron microscope (SEM). For both NMC and LFP, slurries without agglomeration were able to obtain and the excellent dispersion of the electrode materials was confirmed by SEM observation. The battery performance of laminated pouch type cell was compared with the slurry made by using conventional process. Both the rate characteristics and the cyclic performance showed better property in comparison with the conventional process.

The test results indicated the advantage of continuous process not only improving the battery performance, but also the reduction of slurry production time. Furthermore, continuous process can be a solution for downsizing.