Study of surface modified lithium powder electrode for lithium metal batteries with use of Taylor- Couette Flow

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ABSTRACT
Li metal is the most promising anode material for the next generation secondary battery system because of its high theoretical specific energy density (3860mAhg-1) and the lowest electrochemical potential(-3.04 V versus the standard hydrogen electrode). However, there still remain safety issues arising from dendrite formation during lithium plating process. These issues are the biggest obstacles of commercial availability of lithium-metal battery system. Surface modified lithium powder can be a valuable alternative for its low effective current density, which results from its high specific surface area, and stable interface. Previous research produced lithium powder by using droplet emulsion technique (DET). However, DET method is not suitable for continuous producing and in-situ coating. Here we suggest a new method for the continuous production of the surface modified lithium powder with the use of Taylor-Couette flow. Taylor-Couette flow contactor is an attractive tool for the multiphase systems due to its strong mixing power. An electron probe x-ray micro-analyzer (EPMA) and a scanning electron microscope (SEM) were used to determine the size of the powder and identify the coating layer. Furthermore, electrochemical analysis confirmed the stability of surface modified lithium powder anode. This study can provide a new way to produce the surface modified lithium powder as an anode material for lithium metal battery systems such as Li-LVO, Li-S and Li-oxygen batteries.

Keywords: Anode, Continuous process, Energy, Energy storage, Secondary battery