Preparation and Characterization of Li_2S-C Composite Electrode for Sulfide Based All-solid-state Battery

Gi Hwan Chang, Han Ul Choi, Hyung-Tae Lim

School of Materials Science and Engineering, Changwon National University, 20 Changwondaehak-ro, Changwon, Gyeongnam, 641-773, Republic of Korea

E-mail: khchang7@naver.com

The electrodes of all-solid-state cells have limited interfacial contact with the electrolyte as compared with the lithium-ion battery, and so it is necessary to increase the interfacial contact including the solid electrolyte during the production of the electrode[1-4].

Therefore, the electrode fabrication process is step-wise and complex, and also needs to be simplified. In order to simplify the fabrication process, composite cathode was prepared using lithium sulfide instead of sulfur. In the lithium sulfide composite electrode synthesis step, amorphous [$(80+\alpha)Li_2S$-$20P_2S_5$ (mol %)] is synthesized by planetary ball milling and the remained lithium sulfide acts as an active material.

Lithium silicide ($Li_{4.4}Si$), sulfide-based glass (Li_2S-P_2S_5), and lithium sulfide composite (Li_2S + P_2S_5 + acetylene black) were prepared as anode, solid electrolyte, and Li_2S cathode, respectively.

The electrochemical performance was examined under a constant current 200μA (130μA/cm^2) to investigate the property of lithium sulfide composite cathode on the gravimetric capacity (mAh/g). The cut-off condition of the cells is from 0.5V to 2.7V. SEM (Scanning Electron Microscope) and EDS (Energy Dispersive Spectroscopy) mapping were performed to analyze the lithium sulfide composite electrode morphology.

References:

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