Electrochemical performance of surface modified composite-cathode for all solid state batteries based on sulfide electrolyte

Hwan Wook Kwak , Yong Joon Park
Department of Advanced Materials Engineering, Kyonggi, Iui-dong, Yeongtong-gu, Suwon-si Gyeonggi-do 443-760, Republic of Korea

E-mail: yjpark2006@kyonggi.ac.kr

As global environmental problems become more prominent, interest in environmentally friendly energy, which can replace existing fossil fuels, is increasing. Among them, studies on electric vehicles and hybrid electric vehicles using secondary batteries as power sources have been actively carried out, so researches on the enlargement of lithium ion secondary batteries are attracting attention. Generally, most electric vehicles use organic liquid electrolytes. Organic liquid electrolytes are inherently flammable and explosive. Therefore, when they are used in automobiles that are likely to face abnormal situations, they have essentially required additional safety devices. The safety device for controlling the explosion and ignition is an additional system, which causes the energy density of the cell to drop. All-solid-state battery using inorganic solid electrolytes are fundamental approaches to stop the safety problem of lithium secondary batteries using liquid electrolytes. Replacing the liquid electrolyte with an inorganic solid electrolyte does not require an additional device to control the existing safety problems, so a relatively higher energy density battery can be made. Especially, a sulfide-based solid electrolyte having a high ion conductivity is expected to be able to realize excellent performance in manufacturing all solid-state batteries because of high ion conductivity and easy processing. However, the sulfide-based solid electrolyte has high reactivity with the cathode active material to form an unwanted interface layer, which is a major cause of degradation. In this study, a chemically stable materials were coated on the surface of cathode to control the unwanted reaction between the sulfide-based solid electrolyte and the Ni-rich cathode. The unstable interface between the cathode and the sulfide solid electrolyte is expected to be improved by coating a stable materials capable of Li conduction, thereby improving the electrochemical performance of the all-solid-state battery.

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