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Properties of thermal batteries containing the ceramic felt separators infiltrated using LiCl-KCl and LiF-LiCl-LiBr electrolytes

Sang Hyeok Chae, Kati Raju and **Dang Hyok Yoon**
Yeungnam University, Republic of Korea

Due to their excellent mechanical robustness and superior stability for long-term storage, thermal batteries have been used as the primary power sources for many military applications that need prompt electric power. Thermal batteries are activated by the melting of solid electrolyte into molten salt at high temperature. The components for current thermal batteries, such as the cathode, anode and electrolytes, have been synthesized by simple pellet pressing using a ceramic powder, which are inherently fragile during handling, particularly with a thin and large dimension prepared to enhance the electrochemical properties. To prevent the fracturing of electrolyte that causes the short circuit, the use of separators with porous ceramic felts instead of pressed pellets can be an alternative way. The use of a thermally and chemically stable ceramic felt separator for thermal batteries is believed to enhance the reliability by minimizing the sudden failure of an electrolyte upon shock compared to the conventional pellet-pressed one. Therefore, the behaviors of two kinds of molten salt electrolytes, LiCl-KCl (melting point: 350°C) and LiF-LiCl-LiBr (melting point: 450°C) infiltrated into the commercially available alumina and zirconia ceramic felt separators were examined. Experimental assessment of the wetting and infiltration behaviors along with the loading and leakage rates were evaluated at their molten temperatures on the ceramic felts. A comparative study for the electrochemical properties of thermal batteries containing the ceramic felt separator will be also presented.

Biography

Sang Hyeok Chae is currently a Graduate student at the School of Materials Science and Engineering at Yeungnam University, South Korea. He is studying the development of more reliable thermal batteries by replacing the pellet-pressed electrolyte into the porous ceramic fiber felts infiltrated with the molten electrolytes.

shchae@ynu.ac.kr

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