Magnesium Stannide as a High Capacity Anode and its Performance Improvement for Mg-ion Batteries

T.H.G. Nguyen,† J.-A. Seo,† D.T. Nguyen, S.-W. Song*
Department of Chemical Engineering & Applied Chemistry,
Chungnam National University, Daejeon, 34134, Republic of Korea

E-mail: swsong@cnu.ac.kr
† Equal contribution

Rechargeable magnesium (Mg) battery is one of the potential candidates of beyond-lithium batteries for a use in energy storage systems due to the earth-abundance in the earth's crust, good safety features and high specific volumetric capacity (3833 $mAhcm^{-3}$) of magnesium. The formation of surface-blocking passivation layer at the surface of Mg metal anode in conventional-type electrolyte in the Mg metal batteries, and high temperature (60 - 100 ^{o}C) cell operation in a particular electrolyte solvent, however, hinder their practical utilization. Recently we have demonstrated first the development of insertion-type magnesium stannide, Mg_2Sn, which is a Mg source with a high theoretical capacity of 641 $mAhg^{-1}$ and exhibits a high potential as an alternative anode to Mg metal enabling Mg-ion batteries. The Mg_2Sn anode exhibits the low plateau at 0.2 V versus Mg/Mg^{2+} for Mg^{2+}-extraction and -insertion,[1,2] which can provide a high cell voltage of the full-cell with Mg-free cathode. In this presentation, we would report the electrochemical studies and the improvement of cycling performance of Mg_2Sn anode in Mg-ion cells by optimizing various experimental parameters.

Acknowledgements

This work was supported by National Research Foundation of Korea (2015062107) and Creative Human Resource Development Consortium for Fusion Technology of Functional Chemical/Bio Materials of BK Plus program by Ministry of Education of Korea.

References:

[1] D.T. Nguyen, X.M. Tran, J. Kang, and S.-W. Song, ChemElectroChem 3 (2016) 1813-1819.
[2] D.T. Nguyen, S.-W. Song, J. Power Sources 368 (2017) 11-17.