COMPOSITE CATHODES AS A SUBSTITUTE CATHODE

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As far as we know, composite cathode with LiF was first reported by Kim [1]. According to his report, $LiFeF_3$ was obtained by the mixing of LiF and FeF_3 as follows;

$$LiF + FeF_2 \rightarrow FeF_3 + Li^+ + e^- \rightleftarrows LiFeF_3$$

Here, we tried similar technique to obtain LiFeOF as follows;

$$LiF + FeO \rightarrow FeOF + Li^+ + e^- \rightleftarrows LiFeOF$$

Because it is also difficult to synthesize the LiFeOF single phase as well as $LiFeF_3$ [2].

As the substitute cathode for rocksalt-type LiFeOF, LiF and FeO composite was prepared by the dry ball-milling method under ambient pressure. The reversible capacity was 274 mAh/g with an average voltage of 2.6 V. As shown in Table 1, the energy density was over 712 mWh/g and it means that the composite cathode has the highest energy density among iron-based insertion-type cathode active materials. The electrochemical activity was also confirmed by the charge and discharge reactions in the full cell with LiFeOF cathode and $Li_4Ti_5O_{12}$ anode. In this presentation, the other examples of iron-based composite cathode will be introduced such as and $LiSO_4$-$FeSO_4$ and LiF-Fe [3].

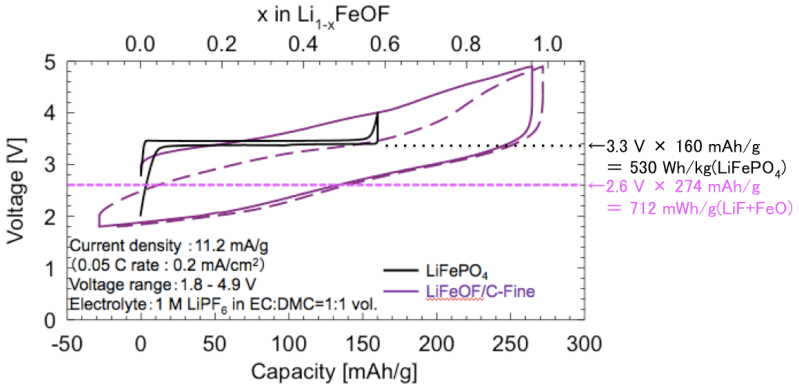

Fig. 1 Charge/discharge profiles of $LiFePO_4$ and LiF-FeO composite cathode vs. Li.

Table 1 Comparison of the cathode properties between $LiFePO_4$ and LiF-FeO composite cathode.

Cathode	Discharge capacity	Discharge voltage	Energy density
$LiFePO_4$	150 mAh/g	3.3 V	495 mAh/g
LiFeOF(LiF + FeO)	290 mAh/g	2.5 V	725 mAh/g

References

[1] S.-W. Kim, K.-W. Nam, D.-H. Seo, J. Hong, H. Kim, H. Gwon, and K. Kang, *Nano Today*, **7** (2012) 168.
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[3] H. Hori and S. Okada, *Electrochemistry*, **83** (2015) 909.