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\textsubscript{3} was obtained by the mixing of LiF and FeF\textsubscript{3} as follows;

\[ \text{LiF} + \text{FeF}_2 \rightarrow \text{FeF}_3 + \text{Li}^+ + e^- \rightleftharpoons \text{LiFeF}_3 \]

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

\[ \text{LiF} + \text{FeO} \rightarrow \text{FeOF} + \text{Li}^+ + e^- \rightleftharpoons \text{LiFeOF} \]

Because it is also difficult to synthesize the LiFeOF single phase as well as LiFeF\textsubscript{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\textsubscript{4}Ti\textsubscript{5}O\textsubscript{12} anode. In this presentation, the other examples of iron-based composite cathode will be introduced such as and LiSO\textsubscript{4}-FeSO\textsubscript{4} and LiF-Fe [3].

![Fig. 1 Charge/discharge profiles of LiFePO\textsubscript{4} and LiF-FeO composite cathode vs. Li.](image)

Table 1 Comparison of the cathode properties between LiFePO\textsubscript{4} and LiF-FeO composite cathode.

<table>
<thead>
<tr>
<th>Cathode</th>
<th>Discharge capacity</th>
<th>Discharge voltage</th>
<th>Energy density</th>
</tr>
</thead>
<tbody>
<tr>
<td>LiFePO\textsubscript{4}</td>
<td>150 mAh/g</td>
<td>3.3 V</td>
<td>495 mAh/g</td>
</tr>
<tr>
<td>LiFeOF(LiF + FeO)</td>
<td>290 mAh/g</td>
<td>2.5 V</td>
<td>725 mAh/g</td>
</tr>
</tbody>
</table>

References