

**P3****Molten salt secondary battery using molten iodides**

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Molten salt secondary batteries are a very interesting way to power electric vehicles. One of their advantages is the high conductivity of molten salts. The more interesting system seems to be Li-alloy/FeS<sub>2</sub>. Furthermore, the ability of building bipolar cells enables very high specific capacity and power outputs to be obtained. The main disadvantage of such batteries is the high temperature of operation, generally about 400°C. Our purpose is so to study molten salts which have a lower melting point than this. The eutectic LiI–KI, which melts at 280°C, has been chosen for study. Firstly, we have shown that this eutectic is thermally and electrochemically compatible with the classical LiAl/FeS<sub>2</sub> system. Moreover, the electrical conductivity of this electrolyte is quite comparable with that of the standard LiCl–KCl eutectic.

The experiments we have run have shown what appears to be a self-discharge phenomenon. However, the high rate of this reaction has indicated that this is not just self-discharge. Further investigations have shown that the use of other cathodes, known to be more stable, have given no such effects changes. The use of aluminium, as anodic material, has shown clearly that this metal is corroded by molten iodides.

We next demonstrated that the lithium–aluminium alloy is also corroded by molten iodide. This difficulty has been overcome by replacing lithium–aluminium by a lithium–silicon alloy.

Finally we have shown that the system LiSi/LiI–KI/FeS<sub>2</sub> is as good as LiAl/LiCl–KCl/FeS<sub>2</sub>, even though it operates at a lower temperature. Our next step is to use the eutectic LiI–KI–CsI, which has a melting point lower than 230°C.

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**P4****Thermoelectric properties of electrochemical systems**

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A detailed analysis has been carried out on the thermoelectric properties of electrochemical systems comprising:

1. redox components, for example Pt/Fe<sup>2+</sup>/Fe<sup>3+</sup>/Pt
2. acid solutions with hydrogen electrodes
3. copper, nickel, zinc, and cadmium salt solutions with corresponding metal electrodes.

The influence of the temperature difference, the nature of the electrolyte solution and its concentration upon the electromotive force (EMF) of non-isothermal systems, Seebeck coefficient, thermoelectric potential and parameters of transfer processes in a liquid phase have been examined. It was shown that increasing the number of methyl groups in dibasic organic acids led to a decrease in the thermal flow contribution to the ion flow in non-isothermal systems with redox components. The increase in EMF for thermoelectric power sources with infinitely diluted aqueous solutions of mineral acids, or with redox components, is connected to the decrease of the acid's anion heat transfer.

A mathematical model describing the EMF dependence on a liquid phase concentration, electroconductivity, proton transference number and diffusion coefficient has been elucidated for non-isothermal systems based on hydrochloric, sulfuric, and orthophosphoric acid. A correlation between the evolution of EMF with the electrolyte concentration in the above systems and the diagrams of fusion, viscosity, and electroconductivity has been established and discussed. Maximal values of EMF for thermoelements with hydrogen electrodes correlate well with the maximal melting temperature of the hydrate. Using the experimental data, values of both the homogeneous thermoelectric potential for some salt-water systems with metal electrodes, and entropies of electrochemical, diffusional and migrational transfer of protons in acid solutions have been calculated. It was demonstrated that the imposition of a regulated temperature difference between electrodes considerably improved the parameters of hydrogen–oxygen fuel cells.

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**P5****Performance of 2,4 dinitrophenol as positive electrode in a magnesium reserve battery**

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Magnesium is an interesting anode battery material with many advantages such as its high standard potential of –2.37 V, low cost, good low temperature performance due to exothermic corrosion reactions during discharge etc. On the other hand, organic aromatic nitro compounds, as they undergo multielectron transfers of up to 18 during