SOLUBILITY OF GASES IN MOLTEN CARBONATE BEHAVIOR OF SILVER-AIR CATHODES IN CORRESPONDING FUEL CELLS

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ABSTRACT

The solubility of oxygen in three different carbonate melts was determined by means of an amperometric titration method. At 700°C, the order of magnitude is $4 \cdot 10^{-7}$ moles/atm.ml melt. The dissolution is endothermic and dependent on cation environment. On basis of the oxygen data the solubilities of both H_2 and CO at 700°C could be estimated from limiting diffusion currents at a rotating Pt electrode: $9 \cdot 10^{-7}$ and $8 \cdot 10^{-7}$ moles/atm.ml melt respectively. A strightforward analytical method to check the above results is in progress.

Silver metal and copper (II) oxide, being suitable cathode materials in fused carbonate fuel cells, tend to dissolve in the melt. The solubility of Ag^+ ions was determined in various eutectic alkali carbonate mixtures. There is a marked influence of the cation environment. In absence of K^+ ions (Li-Na melts) the temperature coefficients of the solubilities have "anomalous" (positive) values; in K^+ -rich melts a more normal behavior is found (greater solubility and negative temperature coefficients).

The solubility of copper (II) ions in $LiNaCO_3$ has been determined also. Here the results are completely anomalous and, in contrast to Ag ions, strongly point to complex formation; possibly CuO_2^{2-} ions. The effect upon cathodic operation of fuel cells (corrosion phenomena) is pointed out briefly.

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