Characterisation of interfaces in a rechargeable aqueous lithium-air cell

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Lithium-air batteries have the potential to be very high energy density batteries but also low cost. There are two approaches to the development of these batteries: the anhydrous system which uses an organic electrolyte, and the aqueous system which uses an aqueous electrolyte. The aqueous system has the advantage of being safe and it does not use any toxic or inflammable solvents. The negative lithium electrode is separated from the aqueous electrolyte by a thin ceramic water and gas tight membrane which enables the battery to have an extremely low self-discharge rate.

The interface between the lithium metal and the ceramic membrane plays an important role in the cycling performance of the aqueous lithium air cell. The ceramic electrolyte is an intrinsic lithium ion conductor and lithium is deposited and is consumed from this type of interface by a one dimensional mechanism. This mechanism is very different to that observed in a polymer electrolyte where a three-dimensional growth mechanism is possible.

Lithium ion - lithium metal transfer from a lithium ion conducting ceramic interface and from a lithium ion conducting polymer interface has been studied impedance spectroscopy and is reported.