Water Stable Lithium Metal Electrode for Lithium-air Batteries

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A water stable multilayer lithium-metal anode consisting of a lithium metal, a PEO based polymer electrolyte, and a NASICON-type lithium ion conducting solid electrolyte was proposed as the lithium anode for lithium-air secondary batteries. This type lithium electrode could be used as the anode for aqueous lithium-air batteries and also is quite effective to protect the water contamination from air in organic electrolyte lithium-air batteries.

The stability of the NASICON-type solid electrolyte, $Li_{2-x-y}Ti_{1-x}Al_x(P_{1-y}Si_yO_4)_3$, in aqueous solutions was examined and found that the electrolyte is unstable in strong acid and basic solutions, but stable for a long period in a neutral solution with lithium ions. The interface resistances of the water stable lithium metal electrode were measured using a ac impedance technique. The significant resistance was observed between the lithium metal and the polymer electrolyte. These resistances and a dendrite formation of lithium in a lithium deposition were improved by addition of a nano-size inorganic filler and a ionic liquid into the polymer electrolyte.

In this talk, we will discuss the possibility of the aqueous lithium-air secondary batteries using the water stable lithium metal electrode.