

Electrochemical Studies of Si, Si-Ge- and Ge-Air Batteries

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Abstract : Silicon-air battery is highly promising for electric vehicles due to its high theoretical energy density (8470 Whkg^{-1}) and its discharge products are non-toxic. For the first time, pure silicon and germanium powders are used as anode material. Nickel wire meshes embedded with charcoal and manganese dioxide powder as cathode and concentrated potassium hydroxide is used as electrolyte. Voltage-time curves have been presented in this study for pure silicon and germanium powder and 5% and 10% germanium with silicon powder. Silicon powder cell assembly gives a stable voltage of 0.88 V for ~20 minutes while Si-Ge provides cell voltage of 0.80-0.76 V for ~10-12 minutes, and pure germanium cell provides cell voltage 0.80-0.76 V for ~30 minutes. The cell voltage is higher for concentrated (10%) sodium hydroxide solution (1.08 V) and it is stable for ~40 minutes. A sharp decrease in cell voltage beyond 40 min may be due to rapid corrosion.

Keywords : Silicon-air battery, Germanium-air battery, voltage-time curve, open circuit voltage, Anodic corrosion

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