

Combinatorial High-throughput Optical Screening of High Performance Pd alloy Cathode for Hybrid Li-air battery

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Combinatorial high-throughput optical screening method was developed to find the optimum composition of highly active Pd-based catalysts at the cathode of the hybrid Li-air battery. Pd alone, which is one-third the cost of Pt, has difficulty in replacing Pt; therefore, the integration of other metals was investigated to improve its performance towards oxygen reduction reaction (ORR). Among the binary Pd-based catalysts, the composition of Pd-Ir derived catalysts had higher performance towards ORR compared to other Pd-based binary combinations. The composition at 88 : 12 at. % (Pd : Ir) showed the highest activity towards ORR at the cathode of the hybrid Li-air battery. The prepared Pd₈₈Ir₁₂/C catalyst showed a current density of -2.58 mA/cm² at 0.8 V (vs. RHE), which was around 30 % higher compared to that of Pd/C (-1.97 mA/cm²). When the prepared Pd₈₈Ir₁₂/C catalyst was applied to the hybrid Li-air battery, the polarization of the cell was reduced and the energy efficiency of the cell was about 30 % higher than that of the cell with Pd/C.