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Fabrication of glucose fuel cell using carbon nanowalls as anode electrode HITOSHI NOZAKI, KEIGO TAKEDA, MINEO HIRAMATSU, Meijo University — Glucose fuel cell (GFC) is a promising implantable battery because of the abundance of glucose in body tissue and the possibility of stable power generation through the coupling of the glucose oxidation and oxygen reduction reactions. Glucose is oxidized at the surface of catalytic platinum nanoparticles (Pt-NPs) on the anode, and proton is produced. An ionomer layer as proton conducting membrane is held between anode and cathode. Oxygen is reduced to water at the cathode surface composed of nanocarbon. Since the efficiency of GFC depends on the catalytic ability to oxidize glucose at the anode, structure optimization of anode with Pt-NPs is of great importance in realizing high performance of GFC. Here, carbon nanowall (CNW) film was used as a supporting material of Pt-NPs. CNWs are vertically standing few-layer graphenes to form a self-supported network of wall structures with large surface area. CNW film was grown on SiO2 substrate by inductively coupled plasma enhanced chemical vapor deposition employing CH4/H2/Ar mixture. The CNW surface was decorated with Pt-NPs by the reduction of chloroplatinic acid to form anode electrode. Anode area (Pt-NP/CNWs) was coated with ionomer to form proton exchange membrane. Then the entire area was covered with cathode comprising carbon black embedded in ionomer. The prototype of GFC was immersed in phosphate buffered saline containing 10 mM glucose, and electrochemical measurement was conducted.

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