

Development of Functional Electronics Integrated to 3D Structures via Material Extrusion Printing Process

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Functional electronics are fabricated by printing plastic and metal material using material extrusion printing process. User interface unit including external case and assemble guide is fabricated for the exterior of the functional electronics. Electronic circuit to deliver power to the electronic components and battery slot are fabricated for the interior of functional electronics. New functional electronics are printed right after printing process. The plastic material is adopted for the electronic structure, and the electronic circuit is fabricated by printing a conductive material on the electronic structure. Electronic circuit design including wiring between electronic components on a 3-dimensional structure should be preceded, and electrical wiring is formed simultaneously with printing the conductive material. Conductive polymer and eutectic alloy are used for the conductive materials. The characteristics of 00(unknown) were analyzed and applied to the process parameters for the material extrusion printing process. Each conductive materials had a wide specific resistance variation from hundreds $\Omega \cdot \text{cm}$ to tens $\mu\Omega \cdot \text{cm}$ at same printing parameters. The conductive material is not necessary to post process and is suitable for printing process which immediately fabricates outputs by demonstrating the electrical performance of the electric circuit. Circuit fabrication technology that is not constrained to the boundaries of the dimension is expected to increase the use of 3D printing technology in the electronics industry.

Figures

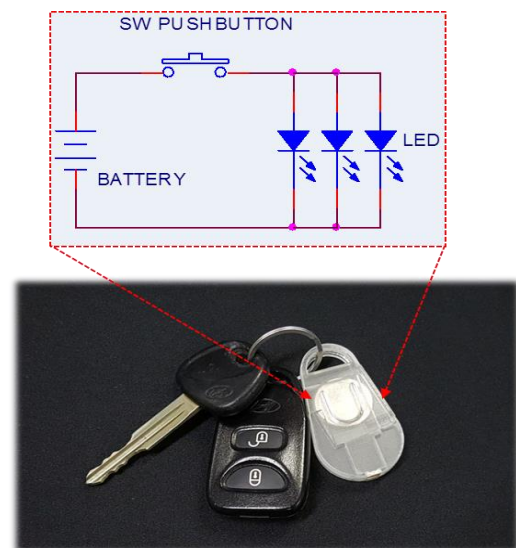


Figure 1. Fabricated of LED circuit integrated plastic keychain.