Development of a Hybrid Inkjet 3D Printer: A Novel Approach to 3D Printing Conductive Architectures and Flexible Electronics

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Engineering Goals/ Questions:The project is attempting to create a hybrid inkjet 3D printer that utilizes two inkjet cartridges and traditional fused filament deposition methods to create embedded electronics. To achieve this goal, the following must occur: 1. Design and build a hybrid Inkjet 3D Printer to fabricate conductive architectures and electronics. 2. Establish a communication system between the inkjet and 3D printer platforms. 3. Create graphene and copper inks with conductive properties. 4. Extrude multiple materials onto a single substrate in one print. Procedure: First, a traditional 3D printer chassis was assembled. A novel 3D printer extruder carriage capable of holding three extruders was designed using Solidworks modeling, and lasercut out of acrylic. Two Inkshield boards were assembled and soldered. A program was created to establish a connection with the printer motherboard. Graphene and copper Inks were then produced and added to the inkjet cartridges. The print thickness was altered as each material was deposited onto a substrate. The materials were reduced under an intense pulse light and the resistance was measured with a multimeter. Data: Engineering a hybrid 3D printer was successful. The novel copper prints tested conductive without further reduction. Directly following the printing of graphene oxide, the print was not conductive, further reduction had to occur. Conclusion: A hybrid inkjet 3D printer capable of producing accurate, conductive, and flexible electronics was successfully created.

Awards Won:

First Award of $5,000