Application of UV Resins in Extrusion-Based 3D Printing

Jacob, Joshua

Purposes/Goals: 1. 3D print and construct a paste extruder and 3d printer to be utilized to print UV resins? 2. Is UV resin accurate to use in fused filament deposition(FFD) 3D printing? 3. Does the thixotropy of the resin affect the overall printing quality? 4. Does the size of the needle (Print head) affect the print quality? Procedure: First, a universal paste extruder was customized and 3D printed. Next, The hardware was collected and the extruder was assembled. The extruder was then mounted onto a 3d printer. UV resin mixtures were prepared. A small square was designed. The design was printed using the 3D printer (CNC movement device) and the connected paste extruder filled with UV resin. Once the print finished, a UV flashlight was used to cure the print. Lastly, the layer height of each print was analyzed along with the overall size change. Data: As the prints were analyzed, the researcher noticed that as the thixotropy of the resins increased, the print quality was increased. The most accurate layer height (20 gauge with 3/5 resin ratio was only 5% off of the set layer height. The same print was only 16% off of the set overall print. With the use of thinner layers, the print quality and object detail was increased. Changing the needle size caused the print quality of the higher ratio mixtures to increase drasically. Conclusion: The best print quality was the product of the resin with the highest thixotropy (3:5 resin to fumed silica ratio) and the 20 gauge needle. The structure of each layer was stronger and produced prints that were very similar to that of a FFD printer on the market today. This printing method was very effective.This self replicating printer is very cost effective and opens many doors in use of new printing materials.

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