Background

- Micro printing electrodes is a method of experimental battery fabrication involving the delivery of electroactive materials in the form of inks.
- The printers that are capable of employing these types of inks are very expensive.
- Modification of commercial inkjet printers could produce the same results for a fraction of the cost.

Objectives

1. Find or create a program that can collaborate with the printer software to accurately create the shape of the electrode desired.
2. Alter the electroactive slurry currently being used to meet the fluid characteristics necessary for droplet formation from the Piezoelectric printer head.
3. Modify the printer to use an aluminum sheet as the medium.

Materials and Methods

Objective 1

- The ability to control each color independently is optimal because it gives the opportunity to use multiple color cartridges in the electrode production.
- For example, if the components of the ink needed to be separated and only be combined once printed onto the substrate, the amount for each cartridge can be controlled to an exact percentage using hues.
- While using the geometric features present, printing directly to the desired size is possible instead of large casts needing to be sectioned.

Objective 2

- The initial undiluted slurry has a surface tension and viscosity of (fill in later) mN/m and 300mPaS, whereas the recommended viscosity is <20 mPaS.[2]
- This puts the Z number out of range of printability which is 1-10[1].
- In order to lower viscosity of the slurry, N-Methyl-2-pyrrolidone (NMP), a liquid solvent, was added into the slurry until it was in a recent range to do a test print.
- The test failed to produce any slurry leaving of the printer head. After disassembling the printer, it was discovered that the filter in the printer head had clogged because of the solid particles in the slurry.
- Sections of the head had melted because of solvent properties of the NMP.

Objective 3

- Using the transparency paper as a supportive backing for the aluminum sheet was successful, making it stable and giving the sheet a necessary tear strength to withstand printing.
- The nozzle size of this particular printer is too small to print a pre-synthesized electrode slurry. This is due to the size of the particles within the slurry.
- The next step would be to combine the printing process and slurry synthesis into one step. This would entail loading several cartridges with the individual components in a liquid solution.
- This would reduce the size of the particles that travel through the printer head and eliminate the conglomeration issue.

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References