

2007 Ohio Student Research Forum

Wright State University
Dayton, OH

RESEARCH ABSTRACT FORM

TITLE: Electrowetting Optics for Display Applications**AUTHOR:** Isaac Carrington Bates**MENTOR(S):** Jason Heikenfeld**INSTITUTION:** University of Cincinnati, Cincinnati, OH

Electrowetting is the study of the contact angle, of a droplet on a surface, with a voltage across it. If there is no voltage then the droplet will stay in its equilibrium position; however with an applied voltage one can control the contact angle of the surface. These principles are the basis to all electrowetting applications.

The electrowetting “umbrella” covers several applications, such as beam steering, smart windows, field effect transistors, solar lighting and displays. I was selected to assist the display team.

To build a basic electrowetting display there is a certain process that needs to be followed. An Ito layer needs to be applied to the glass, followed by a hydrophobic dielectric layer. The reason for this is to have a conductive surface that is transparent and that SU-8 can be applied to. The Layer of SU-8 then needs to be applied in the gold room. This is because SU-8 is a photoresist meaning that UV rays develop it. The gold room is a lot like a film developers room. Next the grid for the pixel size needs to be applied with an exposure from a controlled UV light source. Next the SU-8 is developed to remove all of the areas that were exposed to ultra violet rays. The last step is to dip coat the screen under water so that no air bubbles are present. Once the device is sealed it is completed.

In order to make the display work a voltage has to be applied from a voltage driver. What you will find is at zero volts the pixels are all sitting at their equilibrium position. You will also find that the relationship between voltage and contact angle are linear.