CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
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Project Number
J1310

Project Title
The Amazing Power of OLEDs

Abstract

Objectives/Goals
The goal of this study was to see how the thickness of the emissive layer affects the amount of light output of an Organic Light Emitting Diode (OLED), and to see how the chemical used as the Hole Transport Layer (HTL) affects the light output.

Methods/Materials
Glass coated with a common anode called ITO, was cleansed in water and isopropanol. The 4 drops of a common HTL called PEDOT:PSS was pipetted onto the cleansed glass, while the glass was on the spin coater. The glass was spun at 1290 rpm. The glass was dried with a hot plate and then an emissive layer called Red Diamond 620s was spun coated on, and then dried. The cathode template was stuck on, and then a common cathode called Gallium Indium Eutectic was pipetted on. The cathode cover was stuck on, and then a little bit of HTL and emissive layer was taken off using acetonitrile. The power supply was attached to the anode and the cathode and the power supply was turned on. Measurements of photoresistance were taken using a multimeter hooked up to a light dependent resistor. Measurements were taken every 30 seconds for 10 minutes.

Results
When the spin speed of the emissive layer was increased from 1290 rpm to 2448 rpm there was a 76% decrease in light output. When the HTL was changed from Low Conductivity PEDOT:PSS to High Conductivity PEDOT:PSS there was a 12.4% decrease in light output. One of the devices made with the Low Conductivity PEDOT:PSS as the HTL did not turn on at 6V, the voltage used to turn on the other OLEDs. None of the devices made without an HTL turned on.

Conclusions/Discussion
1290 rpm is a better candidate for spin speed when spin coating the emissive layer because it had a 76% higher light output than the devices with emissive layers spun at 2448 rpm. The High Conductivity PEDOT:PSS is a better candidate as an HTL because more devices worked for the High Conductivity PEDOT:PSS compared to the Low Conductivity PEDOT:PSS, even though the High Conductivity PEDOT:PSS had a 12.4% lower light output than the Low Conductivity PEDOT:PSS.

Summary Statement
OLED devices were made by varying the spin speed when spin coating the emissive layer, also various chemicals were used for the Hole Transport Layer, and the effect on light output was measured.

Help Received
Stephen Clemmet # CEO of Polymertronics, provided OLED components and advice on OLEDs. Bay View Optics provided ITO coated glass and PET substrates. Dad helped with editing and was the Adult Hazards Supervisor. Mom helped with backboard and editing.