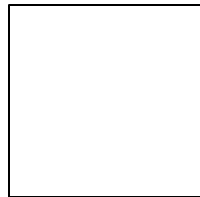
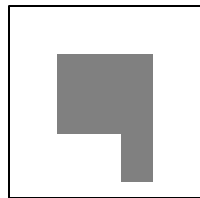


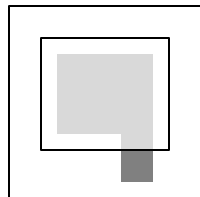
Basic plan for making the 6.976 Electroluminescent Backlight



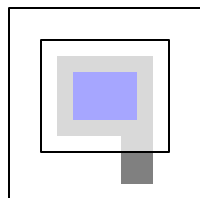
Begin with blank
transparency film



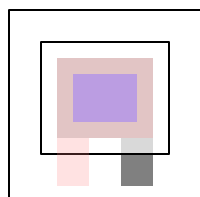
Screen print one
layer of silver print



Screen print two
layers of insulator



Screen print one
layer of phosphor



Screen print one
layer of
transparent
conductor

Pro

Lab guide for 9.976 Lab #1

This lab guide is intended to familiarize you with the equipment and materials with which we will make an electroluminescent lamp.

Safety considerations:

The following safety equipment must be worn while handling chemicals during the lab:

Gloves
Safety Goggles
Labcoat

All necessary safety equipment will be supplied. Shorts and open-toed shoes should not be worn during this lab.

The gloves we will be using provide good protection against contact with solvent containing materials. The resistance to solvents, however, is not infinite. Additionally, once you remove your hands from the fume hood you will carry material out with you. Should you get any material on you please bring it to the TA's attention and also change gloves.

Protective equipment for this lab



Safety Goggles

Labcoat

Gloves

Long pants, closed shoes.

Supplimentary Notes:

-It is not critical that any layer be perfectly pinhole free except for the dielectric layer We will make two prints of dielectric for this reason

-Contact the element with copper tape. Putting a staple through the film and the tape will help keep the tape in place (it's not extremely sticky).

-We will not encapsulate the devices. It is not difficult to do, but adds additional process complications. Encapsulation extends the operating lifetime of the lamp, but lamps we have made last very long in storage without noticeable decrease in brightness. The operating life is unknown.

If you wish to encapsulate your device, let me know, and after the electrodes are attached we can use a silicone encapsulant material. We will have to leave the devices in the lab for 24 hours until they fully cure and pick them up afterwards.

A UV curable (i.e. fast cure) encapsulant is being tested, but the process has not been fully developed yet.

Using the Screen Printing System

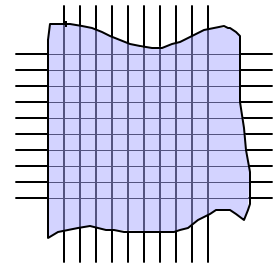
We will be using the Riso Print Gocco screen printing system for this lab. The Print Gocco allows us to define custom screens in a short period of time, and produces screens which perform well.

The screens are not designed for use with solvent based inks and eventually break down, but good results have been obtained nonetheless.

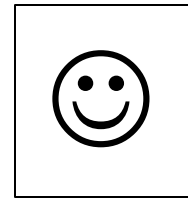
The screens we will be using look like this.



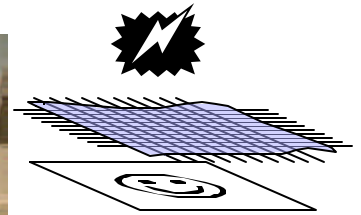
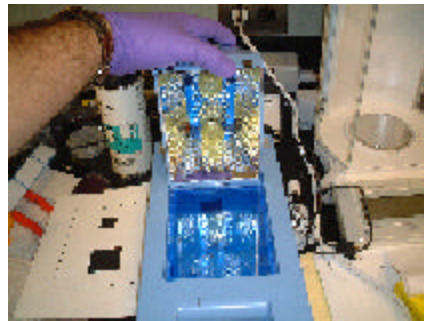
They are made out of two materials. One is a high melting point plastic which is woven into an open screen. Laid over this is a sheet of a low melting point material which is bonded to the screen material.



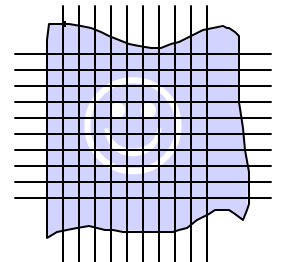
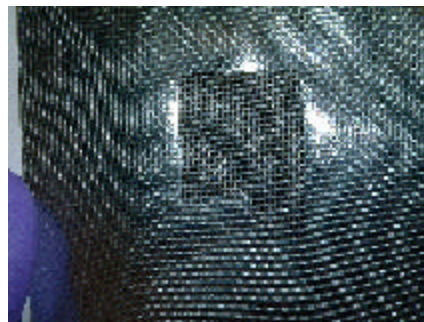
An original is printed using a laser printer.



The laser printed sheet is placed in contact with the screen in the exposure unit. Magnesium flashbulbs are then discharged over the screen which locally heats the printer toner. The low melting point material fuses to the toner covered areas.



The screen is peeled off of the original. Where the low melting point material has fused to the toner it pulls off of the mesh and the screen is opened. The screen is now ready for use.



Screening the Ink

Once the screen is prepared, we will apply it to a plastic film using regular silk screening techniques. Because the surface we are printing onto is not absorbant, we will use a spacer to allow the ink to flow better.

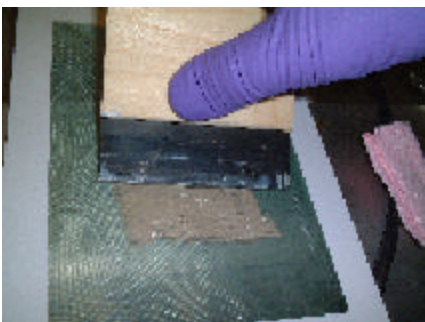
We will use transparency film as the substrate for this step. Transparency film is made from a heat resistant polyester which can withstand the temperatures we will be using.



Next, spread some ink onto the screen near the opening. Make sure it reaches across the entire pattern area.



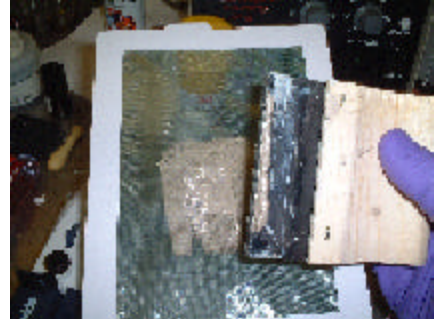
Place the inked screen onto the substrate using a spacer, and make a second pass in the same direction, keeping the inked side of the squeegee on the leading edge. If there is not quite enough ink add more before performing this step or scrape some off the squeegee with the spatula and apply it to the screen again.



First, stir the ink to bring it to the right consistency using a clean spatula.



Using a clean squeegee and holding the frame away from the surface, make a pass to fill the screen area with ink.



Lift the frame and place the sample onto the hotplate (130C for 5 minutes).

