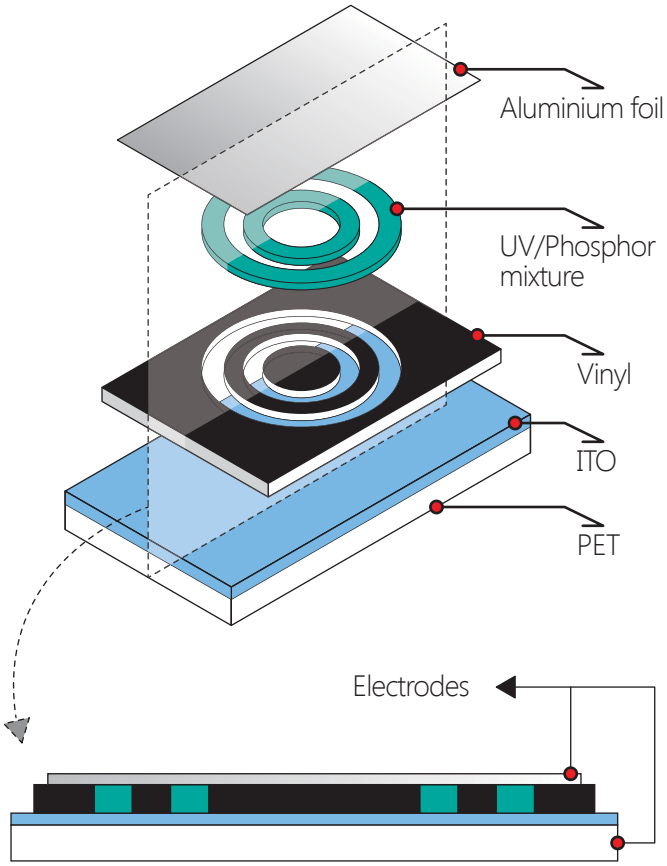
DIY guide: Electroluminescence

Electroluminescence (EL) is the emission of light when phosphor particles are placed in a strong electric field. An electric field exists between two electrodes, with an opposite charge, when a non-conductive layer is placed between the two electrodes called the "dielectric". No current should flow from electrode to electrode directly as this will cause a short circuit and a malfunction in the EL device. One of the electrodes needs to be transparent in order to let the light out.
In order to create a strong electric field you can increase the voltage or change the distance between the electrodes. This guide will focus on making the distance between electrodes as small as possible. The electrodes used in this guide are aluminium foil and ITO PET. ITO is a very thin and delicate electrically conductive layer that is applied to a sheet of PET which is not visible by sight.
The UV/phosphor mixture consists of phosphor powder and UV curing adhesive (only cures under the influence of UV light).
The layers are ordered as such that the two electrodes are as close to each other as possible. The vinyl and UV adhesive will function as dielectric layers, insulating both electrodes.
This workshop will start at step 3.

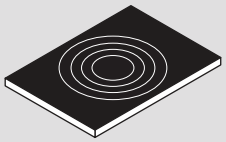


Be careful when handling the EL panel when it is on. You can get a shock if both electrodes are touched simultaneously.
Wash your hands if the mixtures has gotten on your hands.

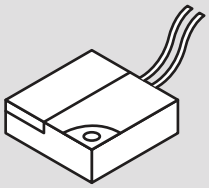
Required equipement

UV/Phosphor mixture

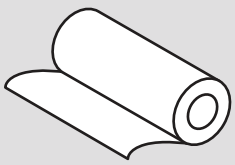
UV lamp



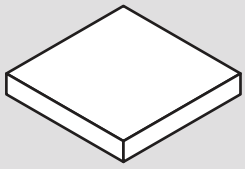
Vinyl



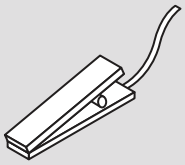
Inverter



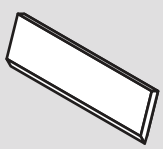
Aluminium foil



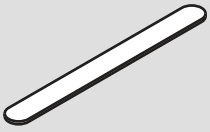
Flat work-surface



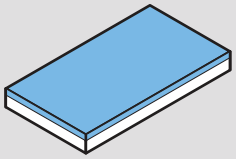
Clamps 2x



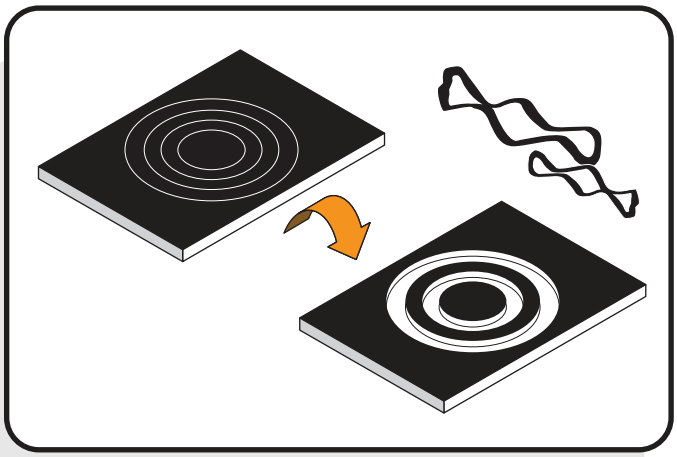
Scraper



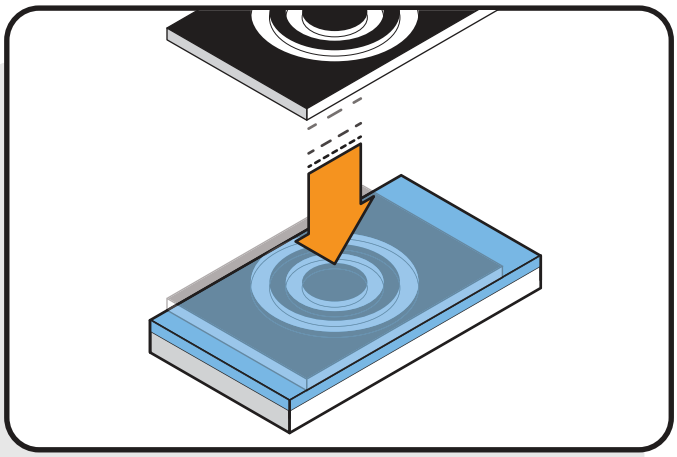
Mixing stick



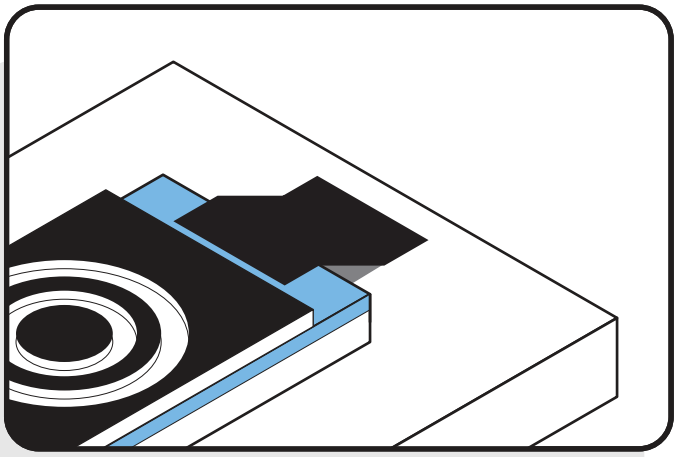
ITO PET



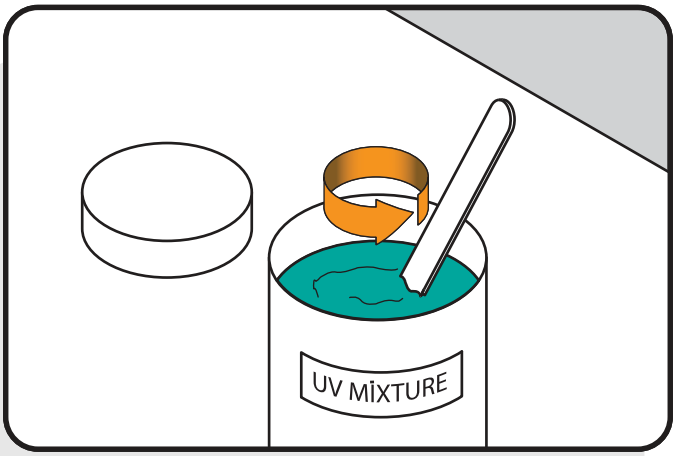
1 Remove the parts of the vinyl that are not needed. These parts will be filled with the UV mixture.



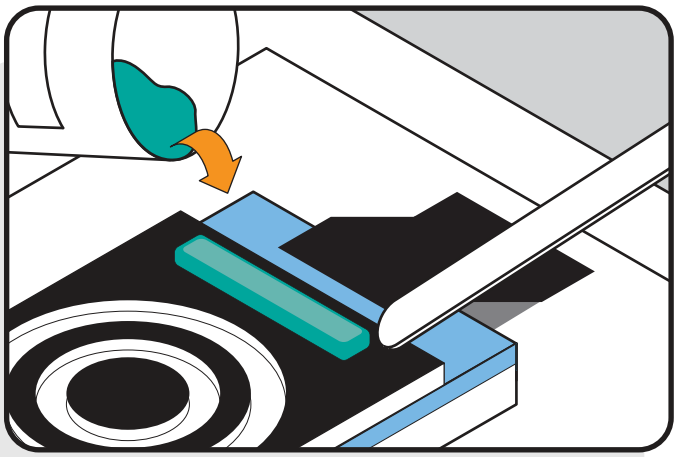
2 Carefully place the vinyl on the ITO side of the ITO PET. If the cut-out part is complex a piece of transfer tape might be required.



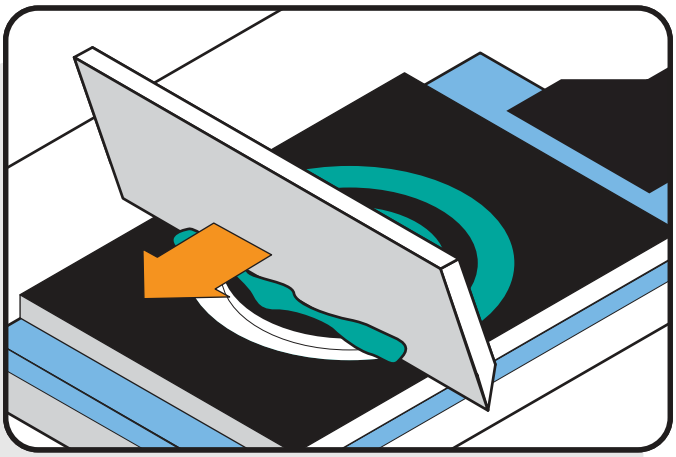
3 Adhere the top side of the ITO pet to the (clean) working surface with a piece of tape.



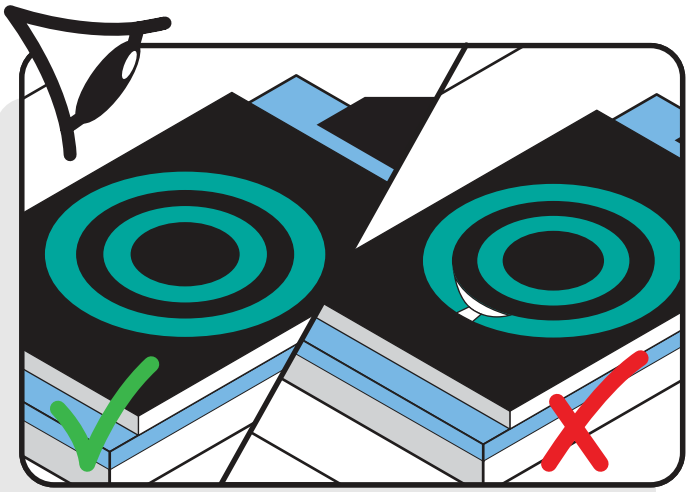
4 Stir the UV/phosphor mixture properly right before application. Phosphor particles will start to sink to the bottom after a minute, this requires stirring to create a homogeneous mixture.



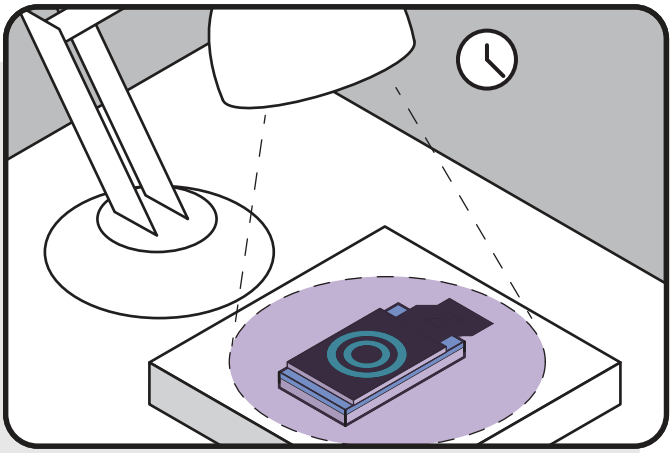
5 Apply a line of the mixture above the cut-out on top of the vinyl. Be careful not to apply too much. More can always be added later.



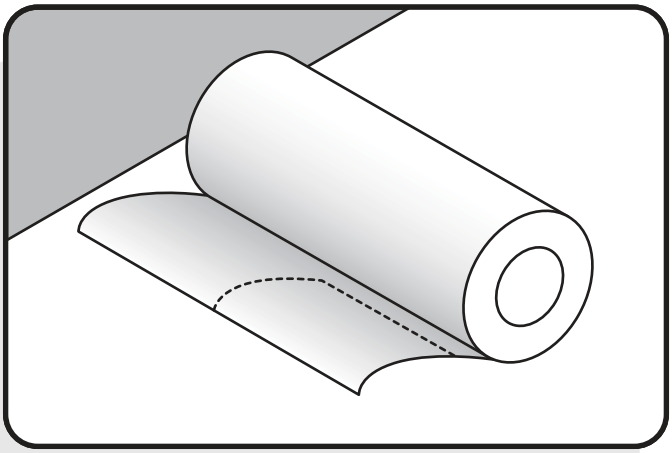
6 Use the scraper with enough pressure, to spread the mixture over the vinyl. If the coverage is insufficient repeat step 4, 5 and 6.



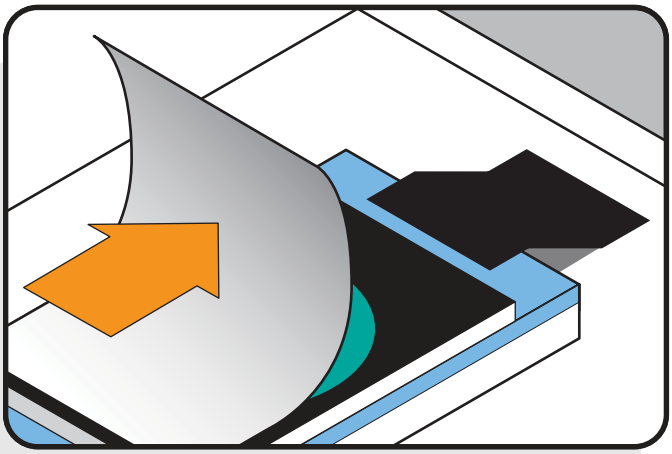
7 Once the mixture is spread, perform a final visual check on proper coverage. Holes in the mixture layer can cause a short circuit.



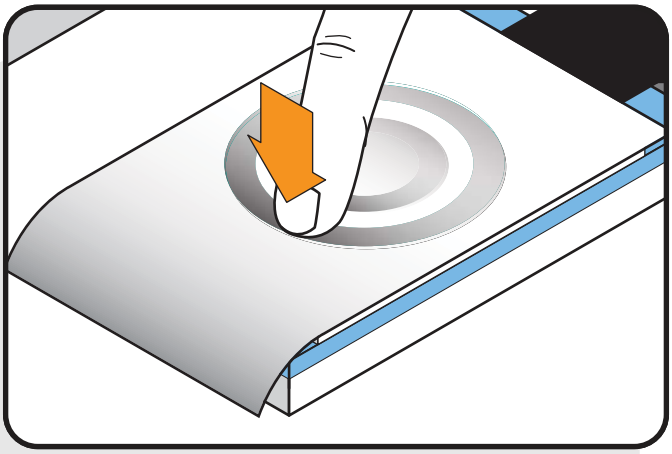
8 Place the working surface underneath the UV lamp and let it cure for 1 minute. *UV adhesive that is in contact with oxygen will create a tacky outside layer. This effect will be used to bond the aluminium foil next.*



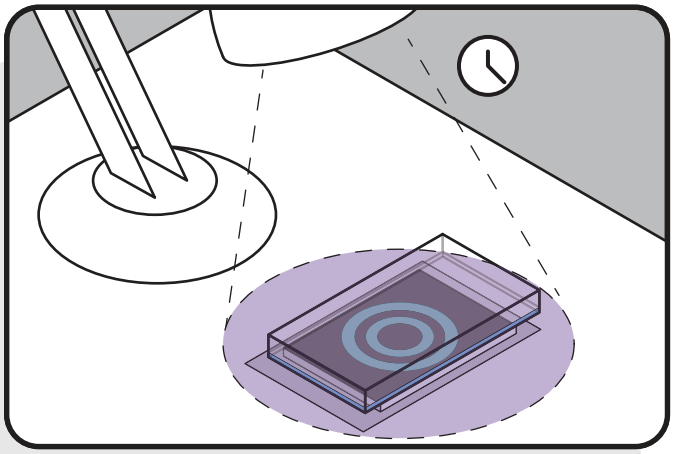
9 While you are waiting cut a piece of aluminium foil slightly smaller than the piece of vinyl, but large enough to cover the parts that are filled with the mixture.



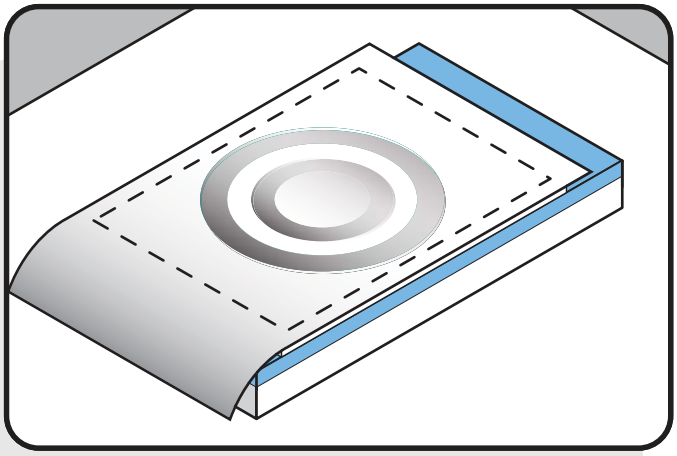
10 Once the UV mixture is partially cured the piece of aluminium foil can be placed on top. Make sure that there is as little air as possible between the foil and the mixture.



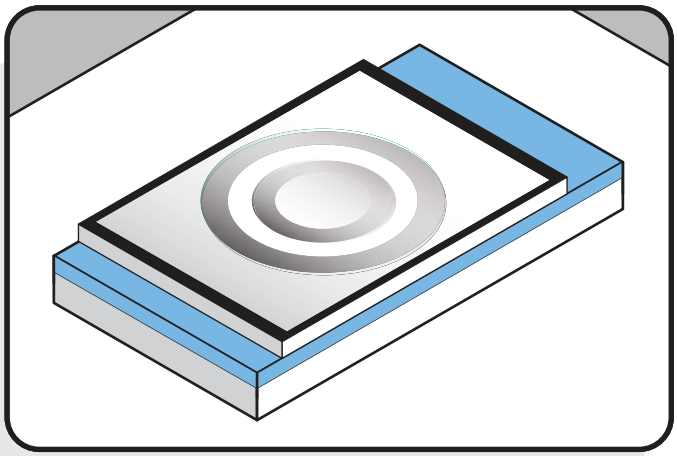
11 Press down on the foil where the mixture is located using firm pressure. This is done to remove trapped air as much as possible. This is important in order to reach good emission.



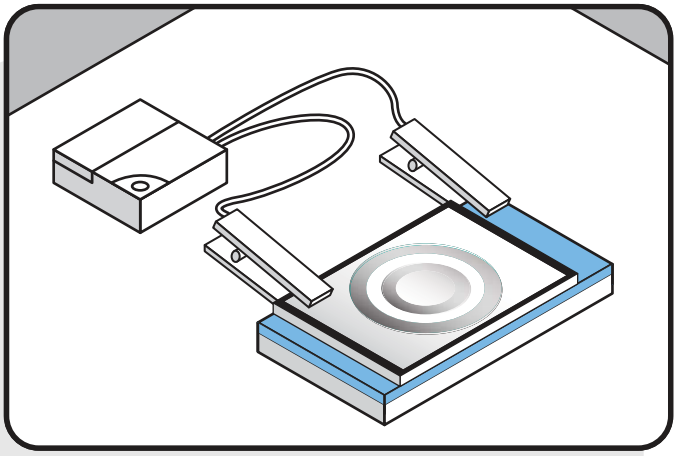
12 Remove the tape that fixated the ITO PET and flip the material so the mixture can be seen through the ITO PET. Place it underneath the UV lamp for an additional 120 seconds.



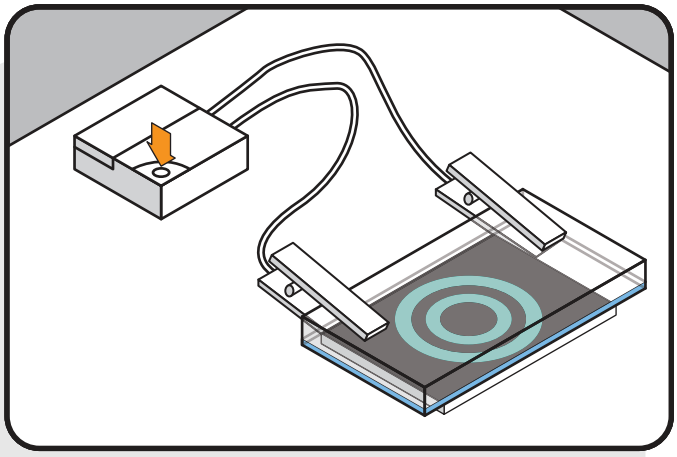
13 Once the mixture is fully cured, remove the parts of the aluminium foil (if this is needed) to the point that no part of the foil can touch the ITO side of ITO PET.



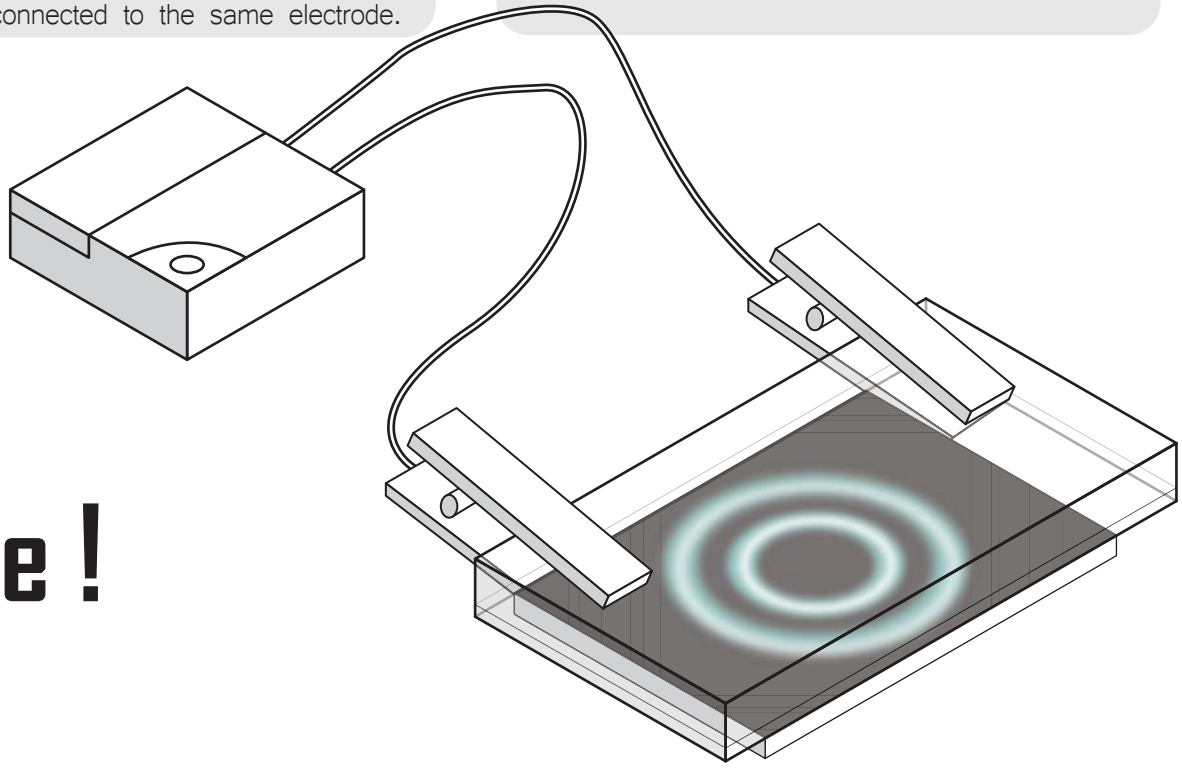
14 After cutting the foil the EL device should look like this. If the aluminium foil is smaller than the vinyl no short circuit should be able to occur.



15 Remove the EL device from your working area and attach the clamps with the conductive side touching the two different conductive layers. Make sure the connectors are not connected to the same electrode.



16 Flip the device and turn on the inverter.



Done !