



FH MÜNSTER  
University of Applied Sciences

**CIW**

**Fachbereich Chemieingenieurwesen**  
Department of Chemical Engineering

**Lab Work Advanced Inorganic Chemistry**

**OLED production:**

**Electroluminescence with**  
**Polyvinyl carbazide (PVC) as hole conductor**

Version 11/2023

## **Experimental procedure**

An OLED is to be produced in this experiment. The required components (phosphors, substrate and hole conductor) must partly be synthesized and then combined using various processes.

### **1. Preparation of the required solutions**

- 10 ml of a 1 % PVK solution is prepared using chlorobenzene as a solvent. The solution must be filtered through a 2  $\mu\text{m}$  filter paper.

### **2. Preparation of the glass substrate coated with indium tin oxide (ITO)**

#### **a) Cleaning ITO glass (substrate) before etching and spin coating:**

1. Cleaning with microfiber cloth and ethanol
2. Place the glass in a beaker and cover with methanol. Cover the beaker with a watch glass and treat for 10 minutes in an ultrasonic bath under the fumehood.

#### **b) Etching:**

Three stripes on the ITO glass are masked with the help of adhesive tape. To remove the ITO layer from the non-masked areas, place the substrate in a beaker with 60 °C hot, semi-concentrated HCl for about two minutes. Rinse with distilled water and dry the substrate with cellulose.

After removing the adhesive tape, remove residues with acetone.

Check the successful etching with the conductivity meter.

### **c) Thin film application via spincoating**

Place the previously etched substrate carefully in the middle of the spincoater disc and close the lid. Apply approx. 1 ml of the PVC solution with a Pasteur pipette in the middle. The centrifuge is started (300 rpm, 2 minutes). At the end of the program, carefully lift off the substrate. If necessary, clean the backside with cellulose and toluene. Use the UV lamp to test the homogeneity of the coating.

## **3. Apply thin films with the high vacuum evaporation system**

### **a) Phosphors:**

Thickness 10 – 200 nm (depending on formulation)

Apply mask and attach substrate to target.

Mix sample with same amount of quartz sand and fill into boats.

Evaporate the phosphor in a high vacuum. (approx.  $1.5 - 2.5 \cdot 10^{-5}$  mbar)

### **b) Al electrode:**

Thickness approx. 200 – 300 nm

Place the mask on the target and fix it in place.

Fill shuttle with Al wire pieces (total length = 15 cm, length of wire pieces < 2 mm).

Evaporate the Al in a high vacuum. (approx.  $1.5 - 2.5 \cdot 10^{-5}$  mbar)

### **a. OLED formulation:**

- ITO| 1 % PVK Lsg.| 30 nm Alq<sub>3</sub>| 200 nm Al

## **1. Electrical testing of the completed OLED**

Connection to the power supply unit:

Plus = ITO-Electrode

Minus = Al-Electrode

Voltage: 10 – 25 V

