

Bacterial cellulose based OLED's

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Bacterial cellulose (BC) membranes produced by gram-negative, acetic acid bacteria (*Gluconacetobacter xylinus*), were used as flexible substrates for the fabrication of Organic Light Emitting Diodes (OLED). In order to achieve the necessary conductive properties indium tin oxide (ITO) thin films were deposited onto the membrane at room temperature using radio frequency (r.f.) magnetron sputtering with an r.f. power of 30 W, at pressure of 8 mPa in Ar atmosphere without any subsequent thermal treatment. Visible light transmittance of about 40% was observed. Resistivity, mobility and carrier concentration of deposited ITO films were $4,90 \times 10^{-4}$ Ohm cm, $8,08 \text{ cm}^2/\text{V-s}$ and $1,5 \times 10^{21} \text{ cm}^{-3}$, respectively, comparable with commercial ITO substrates. In order to demonstrate the feasibility of devices based on BC membranes three OLEDs with different substrates were produced: 1- a reference one with commercial ITO on glass. 2- A second one with a SiO₂ thin film interlayer between the BC membrane and the ITO layer and 3- a third one just with ITO deposited directly on the BC membrane. The

observed OLED luminance ratio was: 1; 0,5; 0,25 respectively, with 1200 cd/m^2 as the value for the reference OLED. Figure 1 shows the Current density (J) and Power vs applied voltage (V) characteristics for BC substrate device. Figure 2 shows AFM images of the native BC membrane and the ITO/SiO₂/BC substrate. These preliminary results show clearly that the functionalized biopolymer, biodegradable, biocompatible bacterial cellulose membranes can be successfully used as substrate in flexible organic optoelectronic devices.

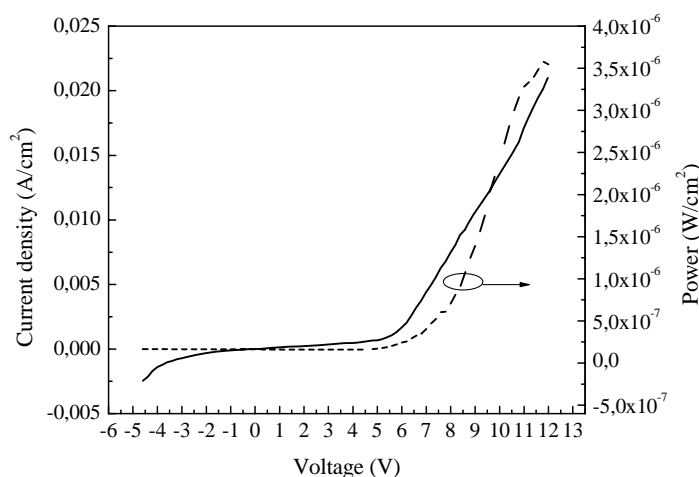


Figure 1- Current density (J) and Power vs applied voltage (V) characteristics for BC substrate device.

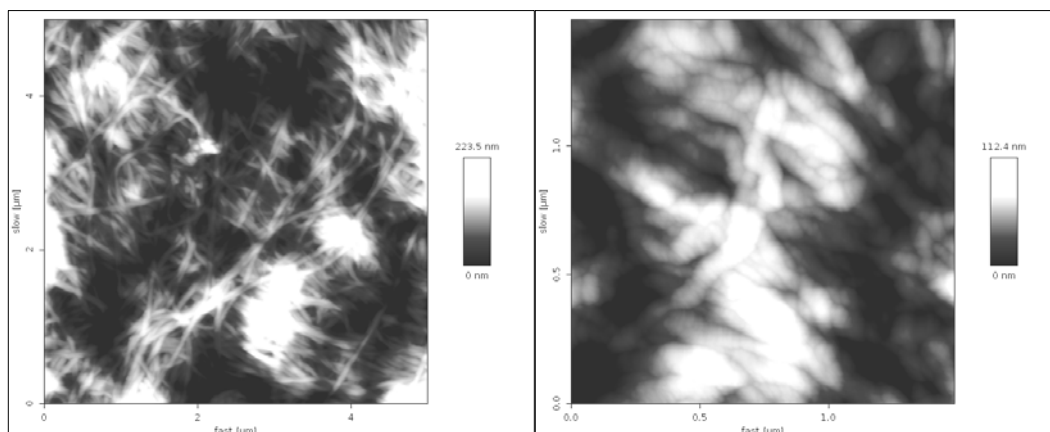


Figure 2- Left- AFM image of native BC membrane showing the microfibrils network
Right- AFM image of the ITO/SiO₂/BC membrane showing ITO crystallites.