

Towards sustainable electronics based on natural materials

Associate Professor Luis Pereira, New University of Lisbon

The growing demand of new and sustainable consumer printed electronics led to the increased interest in devices integrating natural materials. Here we present the work resulting from recent research concerning the application of cellulosic materials and suberin (a cork component) in flexible electronic devices.

First topic to be addressed are printable inks based on carbon fibers and zinc oxide nanoparticles mixed with cellulose derivatives that were optimized to create printed active layers at temperatures lower than 150 °C. This allowed the development of fully screen-printed sensors and electrolyte gated transistors on paper substrates.

Second topic is related to with the development of electrolytic membranes to be used as dielectric in transistors exploring the high capacitance that can be obtained by the formations of electric-double layers. The optimization of the cellulose dissolution method in alkaline hydroxides allowed for self-healable ion-conducting membranes. Addition of suberin introduce anti-microbial characteristics to these membranes.

Finally, we will show how cellulose nanocrystals can self-assemble in a chiral nematic structures that mimic structures existing in nature. These can be then used as dielectric in field effect transistors making possible the detection of circular polarized light in such devices