UNIVERSITY OF NIŠ
Faculty of Technology, Leskovac

# BOOK OF ABSTRACTS

13th SYMPOSIUM

" Novel Technologies and Economic Development "

Leskovac, October, 18 - 19, 2019

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## 13th SYMPOSIUM „NOVEL TECHNOLOGIES AND ECONOMIC DEVELOPMENT“

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## CONTENS

# FUNCTION AND UNDERLYING MECHANISMS OF OLED DEVICES MATERIALS

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Novel materials for the organic light emitting diode (OLED) could have wide application due to their characteristics. Innovations and very quality solutions, lead to application in many areas: in mobile telephones, tablets, displays for digital camera, TVs, in automotive industry, but also as a key part of the innovative luminary products. One promising application could be for windows which might be the source of artificial light when the daylight has gone. Such new equipment is improved to reduce electricity consumption, but one of the main reasons is to make artificial light more similar to daylight and more pleasant to the eye.

It should be emphasized that OLEDs lead to the new lighting design platform that could enable the true integration of lighting and architecture, something that was not possible in the earlier stage. Namely, OLED light sources could be directly embedded onto architectural materials and could also be used to create decorative lighting applications , as well as free-form luminous objects.

OLED light sources are made up of very thin organic layers and they are bright when the current passes through them. It is observed that several materials and techniques could be used for producing. The most used molecules in OLED components include organic-metal composites, like polymer $Alq_3$ - aluminum tris(8-hydroxyquinoline), which was used in the first device that emitted light. In the recent technology hybrid light-emitting layer was developed which used non-conducting polymers doped with light-emitting, conductive molecules. Technologies which can be used in production are organic vapor phase deposition, organic vapor jet printing and nanopatterning. These technologies are very similar to chemical vapor deposition but with improved sequences.

In general, OLED structure consists of several tin organic films which are between two electrode layers. When the voltage is applied to the circuit, electrons and holes are inserted in tin organic films. After that, the carriers move through the structure under the influence of the field, recombine and create excitons. There is a variety in the way of excitation, so a few OLED types can be observed. The oldest way of production is Passive Matrix OLED where row and column selection is the ideal type for small, cheap screens. Active-matrix OLED is an upgraded version and it is used for reducing energy consumption. Transparent OLED is based on idea that all elements should be transparent. Flexible OLED is the most resistive OLED of all and it finds application in mobile phones, watches and jewelry. White OLED is very interesting for application as sources of light, while phosphorescent OLED uses principles of electrophosphorescence to convert electricity from OLED to the light.

The goal of this research is to elucidate function mechanisms in materials applied in OLED devices and possibilities of future research in this area, but also to point out the benefits of their application.