Inks for Alternating Current Electroluminescent Devices: Characterizations and applications

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In the field of printed electroluminescent devices, the growing demand of inks based on nanoparticles compliant with flexible lighting devices has attracted many attentions. In this context, we developed flexible and printed electroluminescent devices with versatile configurations operating under alternative current (ACEL) to stimulate doped ZnS phosphors for light emission. The present work will be focused on the conception and fabrication of economically viable printed electroluminescent devices by discussing new routes that may easily be transposable to industrial scale and compliant with the principle of DNSH 'do no significant harm'. By examining a series of high dielectric permittivity inks or by adding dielectric nanoparticles into insulating inks, the printed ACEL devices display variable brightness for the markup under outdoor conditions. The performances of the ACEL devices in terms of brightness, voltage and frequency were carried out by using iterative optimization of multiple layers by printing process. The increase of the content of dielectric nanoparticles into the ZnS phosphor printed layer improves significantly its luminescence. Our results show that the luminescence is strongly dependent on the intensity of field applied on the ZnS phosphor layer, on the dielectric content and on the thickness of insulator layers. The relationship between the luminescence and electrical characteristics of the ACEL devices were examined as function of the nature of various conductive, dielectric and electophosphor inks. The present work brings an interesting strategy to design and build ACEL devices with scalable and reliable fabrication, it paves the way for various future applications using sustainable inks.