Smart organic device for neonatal phototherapy

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Blue-light phototherapy is the standard of care for treatment of jaundice, presenting the same spectral emission as the electronic absorption spectrum of bilirubin. It acts in the sense to further reducing bilirubin level of serum concentration on neonates, and thus to prevent serious complications, as kernicterus and dead. However, the efficiency of this treatment depends on the spectrum and the total dose of light delivery. Despite the fact that it is extremely simple and highly efficient, it requires some procedures to guarantee its security and accuracy in such a way that the design and development of novel devices to control the radiation dose delivered to the newborns is an actual topic with social and technological stand points. As a consequence, the need for an effective management of the radiation doses planning before treatment of jaundice is obvious. In this work we have developed a low-cost and easy to read device in order to measure the radiation dose for neonatal phototherapy. The operating principle of such device is based on the optical response of poly[2-methoxy-5-(2'-ethylhexyloxy)-p-phenylene (MEH-PPV) and tris(8-hydroxyquinolinato) aluminum (Alq3) materials dispersed in polystyrene (PS) matrix (denoted as PS/MEH-PPV/Alq3). It is observed a blue-shift on the photoluminescence of PS/MEH-PPV/Alq3 system from red to orange-yellow and then to green as function of the blue-light radiation exposure time. The result is attributed to the photodegradation process of MEH-PPV and also to the spectral overlap between emission of Alq3 and absorption of MEH-PPV. The basic idea behind this concept considers the sensor as a traffic light sensor (“smart device”) where red represents underdose and green the prescribed dose or overdose, while orange-yellow suggests that radiation therapy is an ongoing process.

Keywords: luminescent sensor, polymer degradation, jaundice, phototherapy.

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References:


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