Contribution ID: **312** Type: **POSTER**

Fabrication and X-ray characterization of an organic photodetector for indirect X-ray imaging sensor

Saturday, 14 December 2019 14:17 (1 minute)

Digital X-ray imaging systems have been substituting analog X-ray imaging systems with conventional X-ray film-screen for radiography applications. Currently, the large-area flat panel imagers with TFT (thin film transistor) and CMOS (complementary metal-oxide semiconductor) process have been widely used in various X-ray imaging applications. Indirect detection type for digital X-ray imaging is essentially consisting a scintillator film and 2D imaging sensor such as amorphous and crystalline silicon based arrays. Both terbium-doped gadolinium oxysulfide (Gd2O2S:Tb) and thallium-doped cesium iodide(CsI:Tl) are commonly used for conversion of X-ray to visible lights. Currently, the organic polymer-based semiconductor has been widely studied in various field such as OLED display and solar cell due to simple fabrication, cost effectiveness. The organic sensor materials show effective light absorption in emission region of the x-ray conversion scintillator with good photo-generation yield, sensitivity, and response time.
In this work, the conjugated polymer poly(3-hexylthiophene) (P3HT) as a p-type semiconductor and the fullerene derivative phenyl-C61-butyric acid methyl ester (PCBM) as an n-type semiconductor have been used to form the bulk heterojunction(BHJ) structure of the organic photodetector. The solution-processed organic structure was prepared with various manufacturing parameters such as different active layer thickness (100-300nm), blending ratio (P3HT:PCBM=3:1, 1:1, 1:3) and buffer layers(hole and electron transport layer). The various scintillators such as Gd2O2S:Tb and CsI:Tl with columnar structure were used as the X-ray to visible light converter. The fabricated organic active layers in photodetector and scintillators with good green wavelength were optically combined to investigate the X-ray properties.
The properties of the fabricated organic X-ray detector such as the dark current density, X-ray sensitivity, signal to noise ratio, dynamic range were measured under practical X-ray exposure. Typically, our OPDs show satisfactory results with a leakage current density of 10 pA/mm2 at −2 V bias. The sensitivity of our organic detectors linearly increased as the incident X-ray dose increases. This paper will demonstrate the significant potential of our organic photodetectors for medical imaging and NDT applications with low-dose and high-resolution

Submission declaration

Original and unpublished

Primary authors: Dr CHA, Bo Kyung (KERI); Dr JEON, Sungchae (KERI); Prof. SEO, Chang-Woo (Yonsei University); Prof. CHO, Hyosung (Yonsei University)

Presenter: Prof. SEO, Chang-Woo (Yonsei University)

Session Classification: POSTER

Track Classification: Pixel sensors for imaging