



Contribution ID: 62

Type: **not specified**

Polymer Based Ionizing Radiation Detectors

Wednesday 22 June 2022 16:40 (20 minutes)

Recently, semiconductive polymeric materials have attracted attention as an active layer for the detection of ionizing radiation because of their excellent properties such as flexibility, easy production, solution processability and low-cost production. This paper presents X-ray detection properties of Poly(3-hexylthiophene) (P3HT) : Phenyl C61 butyric acid methyl ester (PCBM) blend structure with different PCBM loading ratios. P3HT:PCBM active layer based X Ray detectors were fabricated and effect of PCBM ratio was investigated. All devices were constructed bulk resistive type with ohmic contacts. Spray coated graphite electrode was used as top ohmic contact for all devices. P3HT:PCBM ratio was changed as (1:0), (1:0.5), (1:1), (1:2) and investigate PCBM concentrations how effect X Ray detection parameters with different X Ray dose rate under 10 V bias. Photocurrent of the pure P3HT (1:0) based device increase under X Ray exposure but never reached to steady state level. However, when PCBM loaded into the P3HT photocurrent reached steady state current for all PCBM concentrations. X ray dose rates were changed from 0.35 mGy.s⁻¹ to 8.74 mGy.s⁻¹ for all devices. The photocurrent versus time graph characteristic for PCBM loaded P3HT based devices was saw-tooth shaped. The saw-tooth structure of the photocurrent by applying different dose X-Ray can be indicating potential usage for the X-ray detection.

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Session Classification: IRRAD