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ION-IMPLANTED POLYANILINE THIN FILMS FOR RADIATION SENSING APPLICATIONS

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Polymer based electronics is an emerging technology that is focused on developing electronic devices using semiconducting polymers that can potentially replace silicon based electronics. Polymer based electronics materials are relatively cheaper to synthesize and are mechanically flexible compared to silicon. Metal-polymer nanocomposites, for example, have distinctive electrical, optical and morphological properties that can be useful for device applications. However, fabrication-structure-property relationships of these materials are not yet fully understood, and this warrants further investigative studies. In this work, ppolyaniline thin films were prepared and deposited on an ITO/PET substrate using a spin coater. The prepared films were amorphous in nature, with nanoparticles that were spherical in shape. The size of the nanoparticles was varying from 7.0 to 269 nm with mean particle size of 194.4 nm. The films were then implanted at cryogenic temperature with 50-keV Cu+ ions to different fluences of 0.5x1016, 1.0x1016, 3.0x1016 and 5.0x1016 ions/cm2 to form Cu+-PANI nanocomposite films. Different characterisation techniques were used to investigate a change in structural, optical and electrical properties of the films due to ion implantation. Moreover, the optical band gap and the resistance of the films were found to decrease drastically at low fluence, followed by an infinitesimal decrease at high fluences. The results, in general, indicate that implantation by copper ions to high fluences can be used as an effective tool to tailor properties of the material so that it becomes resistant to change. This stability is suitable for the material to be used for fabrication of the current and future radiation sensors.

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MSc

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