ABSTRACT

Presently, the requisites for production and advancement of polymeric materials are gain broad concern worldwide due to its promising needs in daily life. However, the growing consumption of synthetic polymers triggers the challenges of waste disposal/processing and environmental safety. The recycling cascade of such polymers is a circuitous and intricate process with a negative environmental impact. Therefore, the alternative of conventional polymer is a fundamental and common aspiration of citizens to industries. Hence, *Biodegradable Polymers* broaden its relevance areas and belongings due to its versatile eco-friendly characteristics. Chitin is a bio-based second most abundant polymer after cellulose. Chitosan is a derivative of chitin, obtained by the deacetylation process. The chitosan is the only pseudo-natural cationic polymer with reactive functional amine ($–NH_2$) and hydroxyl (–OH) groups. Apart from the active groups, due to biodegradable and biocompatible versatility, the functionalization of chitosan by physical and chemical routes is being concerned for desired requisites in many areas. The modification of chitosan through these routes, however, evolved chemicals and many other compounds with various parameters. So, in some circumference, explanation and correlation among parameters become complicated, and vital polymeric structure is greatly affected. Besides, swift heavy ions (SHIs) irradiation is found its novel applications and ingenious advancement in the discipline of polymer science. SHIs irradiation is a well-controlled technique, which can modified the materials at the electronic and molecular level due to massively deposited localized energy density. The threshold value for the polymer to instigate the transformation in various properties of polymeric assembly is nearly of the order of a few MeV/μm. These modifications can be explained based on the Coulomb explosion and thermal spike models.

In the present investigation, we have prepared three systems based on the chitosan host matrix *via* solution casting technique. The self standing pristine polymeric matrices of (i) chitosan and CP blend (ii) biodegradable SPE matrix based on chitosan with silver nitrate salt at different concentrations and (iii) biodegradable polymeric nanocomposites assembly based on chitosan and CP blend with silver nanoparticles were prepared. The prepared matrices were subjected to lighter ion C^{+5} (60 MeV) and heavier Ni^{+7} (100 MeV) ions irradiation, to insight and interpret the interaction of MeV ions induced changes as a function of electronic energy loss and fluence. The pristine and MeV ions irradiated films were analyzed by XRD, FTIR spectroscopy, UV-

Visible absorption spectroscopy, impedance analysis, SEM, and AFM analysis. Subsequently, reformed optical, structural, dielectric, and surface morphological properties of self-sustained matrices at different fluences were studied. To achieve the objective of the present research work, a thesis is divided into six chapters, and the content of each chapter is as follows.

Chapter-1 includes a brief discussion of biodegradable polymer and an overview of chitosan. The distinctive approaches are employed for the modification of chitosan. A comprehensive background of SHIs irradiation and its interaction with matter. Literature survey and the importance of chitosan-based matrices are also included. In Chapter-2, synthesis of different matrices, procedures of C^{+5} and Ni^{+7} ions irradiation, and theories of characterization techniques are discussed. The results obtained from different off-line analysis of pristine and MeV ions irradiated (i) chitosan and CP blend (ii) biodegradable SPE matrix and (iii) biodegradable polymeric nanocomposites are discussed successively in Chapter-3, Chapter-4 and Chapter-5. Inclusively, in Chapter-6, the significant findings obtained by C^{+5} and Ni^{+7} beam irradiations at different fluence of the polymeric systems under investigation are summarized along with the future perspectives.