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Chapter-3

Irradiation induced effects on silver nanomaterials

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3.1 Introduction

Due to their superior performance, which is a result of their small size and unique structure, nanomaterials have attracted a lot of scientific interest. Numerous techniques have been utilized to modify the structure and constituents of materials in practical applications in order to obtain high-performance nanoparticles. Ion beam techniques have so far been widely used to modify the performance of different nanomaterials. The surface shape and chemical composition of nanomaterials can be altered by energetic ion beams. Additionally, nanomaterials like 2D materials, nanoparticles, and nanowires have been created using ion beam techniques. Ion beam techniques, such as ion implantation, ion irradiation, and focused ion beam, are all physical processes in comparison to conventional methods. Ion beam techniques also show excellent reproducibility. It's a prevalent misperception that energetic electron and ion bombardment of solids only has negative impacts on the characteristics of the target materials. Recent research demonstrate that ion bombardment can also have advantageous effects on nanostructured materials. It is possible to create nanoclusters and nanowires using electron or ion beams, controllably alter their morphology, and modify their mechanical, electrical, and even magnetic properties. It is necessary to have a complete microscopic understanding of defect generation and annealing in nano targets in order to use irradiation as a tool for changing material properties at the nanoscale. This chapter includes recent developments in ion beam methods for silver based nanomaterial surface modification along with current applications.

3.2 Synthesis of Silver nanomaterials using irradiation:

The creation of crystalline silver nanoparticles using an innovative method based on electron irradiation is demonstrated by Y. Li et al[1]. Silver nanocrystals with diameters ranging from 15 to 40 nm could only be created by subjecting a precursor material to an electron beam. SEM, TEM, XRD, and EELS are generally used to analyze the morphology and chemical