ABSTRACT

Muscovite Mica is a naturally occurring layered aluminosilicate material with variety of technological applications particularly in the field of radiation detection. Radiation response of mica is therefore an advanced topic of consideration when exposed to energetic particles. In this study, the structural and morphological properties of single crystal muscovite mica are explored after implantation of gold ions. SRIM simulation predicted that there is linear increase in the projected range and the nuclear stopping power dominates the electronic stopping power by increasing the incident gold ion energy. 500 keV gold ions after implantation are distributed at around 120 nm depth in mica where numerous types of defects are created. Vacancy distribution shows oxygen atoms in mica are more prone to displace from their equilibrium position as compared to other atoms. XRD analysis shows decrease in the peak intensity and average crystallite size by increasing the ion dose from 10^{12} to 10^{15} ions/cm^2 indicative of reduction in the order of crystallinity. Peak shift in 006 and 0010 planes at the lower angle indicate tensile stresses resulting upon ion implantation arises to the defects produced in the muscovite mica indicative of increase in the volume of unit cell and the d-spacing. Average dislocation density and W-H plots are discussed to estimate the relation between crystallite size and strain in mica as a function of ion dose. OM and SEM analysis shows the presence of surface cracks which increases by increasing ion dose. This is primarily because of the lattice expansion due to incorporation of gold ions in unit cell causing change in lattice parameters that appears in the form of cracks on the mica surface. These results will pave the way towards the advancement of the use of mica as potential unit in radiation detection systems.