ESTIMATION OF RADIATION DAMAGE USING THE RANGE AND STOPPING OF IONS IN MATTER

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Radiation damage refers to the localized disruption of the crystal lattice of solid by high charged and neutral elementary particles passing through it. when there is interaction of an energetic particle with a lattice, kinetic energy transfers to the lattice atom giving birth to primary knock on atom (PKA) which leads to displacement of the atom from lattice site (vacancy) then there is creation of secondary knock on (SKA) during the passage of (PKA) so we will find production of displacement cascade of point defects. In order to describe the radiation damage we need to calculate the energy loss by the moving particle travelled in the medium (stopping power ) and measure the path length in the solid traversed by the particle from the point at which it no longer possesses energy (range).

A Monte Carlo based - binary collision approximation technique is the foundation of the software package stopping and Range of Ions in Matter (SRIM), which computes deposition profiles in materials subjected to energetic ion beams. The displacement or generation of vacancies that results is typically utilized to evaluate the irradiation effects generated by energetic charged particles in terms of structure and alterations of target composition and surface topography, as well as to estimate the local damage dose in displacement per atoms (dpa). There are two options for calculating damage: the full-cascade detailed damage calculation option and the quick calculation of damage (K-P) mode, which is a quick statistical estimate based on the Kinchin-Pease "K-P" formalism and merely follows the path of incident ions. There have been debates and worries over certain observed differences in the number of atomic displacements per ion generated by the two distinct SRIM computation approaches. In order to study and quantify the differences that would occur in each case, various ions with various energies were used in this study to calculate the displacement damage in targets using SRIM provide different damage calculation options in order to get more accurate results for the calculations.