diffusion-fundamentals

The Open-Access Journal for the Basic Principles of Diffusion Theory, Experiment and Application

Spatial Redistribution of Boron Implanted into Poly-(Di-n-Hexyl Silane), (PDHSi)

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Abstract

100 keV $^{10}B^+$ ions were implanted into poly-(di-n-hexyl silane) in different directions at a fluence of $1x10^{14}$ cm^{-2}, and their depth distribution was determined by means of the neutron depth profiling technique. In no case the projectile ions are found to come to rest according to their predicted range profiles. Instead, they are always found to undergo considerable long-range migration. During the irradiation process this motion appears to be radiation-enhanced, and during the subsequent annealing steps one appears to deal with regular thermal diffusion. The implant redistribution is always found to be governed strongly by the self-created damage, insofar as both electronic and nuclear defects in the polymer act as trapping centers. Their population ratio is modified by thermal annealing.

The as-implanted redistribution shows a pronounced directional dependence, which essentially is a consequence of the spatial distributions of the electronic and nuclear damage. The changes of the nuclear defect distribution during thermal annealing are studied by a specially developed tomographic method. It is found that boron is preferentially trapped along the irradiation direction, exhibiting quite pronounced prolate (i.e. cigar-like) distributions. This shape is hardly affected by thermal annealing.