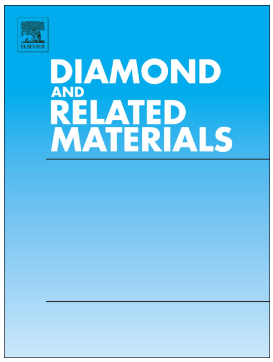


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# Low-temperature annealing of radiation-induced defects in carbon nanotube bundles

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The annealing of radiation-induced defects in carbon nanotube bundles below room temperature has been investigated experimentally. Significant feature of this study is that electron irradiation (with an energy 1 MeV and fluence up to $10^{16}$ el/cm$^2$) was carried out at liquid helium temperature. A detailed analysis of the resistance change over a wide temperature range (7 – 300 K) enables us to prove partial annealing of irradiation-induced defects at moderate temperatures. It is shown that such an annealing follows a first-order reaction in whole investigated temperature range. While at temperatures below 40 K, annealing is nonactivation, tunneling process; at higher temperatures (100 – 300 K) it becomes activated, with activation energy of ~ 0.05 eV. The value of discovered activation energy is close to the migration energy of interstitial carbon atom in graphite. Probably, observed annealing of radiation-induced defects in carbon nanotube bundles is also caused by the migration of interstitial carbon atoms between single nanotubes below room temperature.

## 1. INTRODUCTION

Carbon nanotubes (CNT), due to their unique features of quasi one-dimensional electronic transfer, seem to be promising materials for modern nanoelectronic [1]. Their electronic structure, and hence conductivity, strongly depends both on defects (topological, vacancies, substitutional impurity, etc.), and adsorbents of any type [2]. Therefore, defects introduction of known type and concentration can lead to a controllable modification of CNT properties [3, 4]. Chemical functionalization and high-energy irradiation, including irradiation in various gas media [5 – 7], are commonly used for this purpose. Possible effects of ion and electron irradiation on the properties of CNT networks are presented elsewhere [8 – 10].

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