EPR and optical studies of silica glass implanted by 12C+ and 13C+ ions.

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Abstract

Carbon impurities in SiO2 are important for various technologies. They are caused by synthesis of silica glass from silicon-organic materials or by oxidation of SiC wafers in semiconductor device processing. This paper reports carbon-related defects introduced in silica by implantation of 12C+ (I=0) or 13C+ (I=1/2) ions with 50 keV or 300 keV energies. Optical and infrared absorption, luminescence, and EPR spectra were studied. A comparison between 12C+ and 13C+ ion-implanted samples allows to separate E'-centers and 12C – related signal with g = (2.0006, 2.0032, 2.0035). 13C+-implanted samples show two new doublets separated by 9.5 mT and by 21.7 mT. They are tentatively attributed to 3-fold silicon-bonded carbon radical (Si3≠C·) and Si-bonded CO2 radical (O3≠Si+-CO2·).

Keywords: silica glass, carbon doping, ion, implantation, EPR, hyperfine coupling

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