Comprehensive study of carbonization in B^+-implanted PMMA: A correlation between slow positron beam and Raman spectroscopy results

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Ion implantation is known as an effective technological method to turn dielectric polymers into semiconductors [1] as well as to improve surface-sensitive mechanical properties of polymers for hard-materials applications [2]. Recently, the carbonization process at higher ion doses (> 10^{16} ions/cm^2) has been verified [3] for boron-ion implanted polymethylmethacrylate (B:PMMA) with an energy of 40 keV, ion doses from 6.25×10^{14} to 5.0×10^{16} ions/cm^2, and current density < 2 μA/cm^2 by using slow positron beam spectroscopy based on Doppler broadening of positron annihilation γ rays as a function of incident positron energy and positron annihilation lifetime at an positron energy of 2.15 keV. Also, the carbonization in the B:PMMA has been examined [4] by Raman spectroscopy and electrical measurements. In the present work, a correlation between slow positron beam and Raman spectroscopy results is highlighted for B:PMMA.

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