

Ion induced modification of polymers at energies between 100 keV and 1 GeV applied for optical waveguides and improved metal adhesion

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Polymers are a class of materials widely used for a broad field of applications. Ion irradiation ranging from several eV to GeV is a quite efficient tool to modify the properties of polymers like wettability, optical properties, adhesion between metal and polymer surfaces. In this paper ion induced chemical changes of polymers will be discussed in relation to the modified macroscopic properties. In the field of optical telecommunication, polymers are discussed as a new class of materials for the fabrication of passive optical devices. Ion irradiation is a promising method to generate structures with a modified index of refraction, which is necessary for the guidance of light with different wavelengths in optical devices. Modified optical properties of different polymers under ion irradiation will be discussed. Analytical investigations like infrared measurements and measurement of the outgassing reaction products during irradiation will be discussed to interpret the chemical changes of the polymers. Metallization of polymers is of interest in several fields of application like for multilayer systems in microtechnology or casings for radiation shielding for example. Ion beam mixing at low energies is a promising method to improve the metal/polymer adhesion. Also ion irradiation at high energies applied to a metal/ polymer multilayer can improve the adhesion of a metal layer to a polymer surface, if not sufficient. Different metal/ polymer systems will be presented as well as specific applications.