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Electrical Resistivity of Pt-Implanted Polycarbonate and Polyetherimide*

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Abstract

It has been found by a number of groups that implantation by any of a wide range of different ion species causes the surface electrical resistance of polymers to fall by orders of magnitude. Unimplanted polymers are excellent insulators with surface resistivities of order 10^{14} Ω/square or greater, and polymers that have been heavily implanted can have surface resistivities as low as 10^{2} Ω/square, a range of 12 orders of magnitude. The general shape of the resistivity-dose curve shows an initial decrease from the unimplanted plateau value at doses of order 10^{15} ions/cm^2, falling to a new, low plateau at doses of order 10^{17} ions/cm^2. The origin of the effect has generally been attributed to cross-linking and associated formation of carbon-rich regions in the implanted layer. As the implantation dose increases, the carbonized islands grow and begin to overlap, eventually forming an almost uniform carbonized layer. We have investigated the effect on the surface resistivity of polycarbonate and polyetherimide plastics of Pt ion implantation as a function of dose from 10^{13} to 10^{17} ions/cm^2 at an ion energy of 75 keV. Here we summarize the ion implantation procedure, describe the resistivity results obtained, and compare our findings with those of other investigators.