

Study of polymer surface modifications by ion beams

G. Ferraz, A.O. Delgado, and M.A. Rizzutto

Institute of Physics, University of São Paulo, R. do Matão, tr. R, 187, 05508-090 São Paulo, Brazil

Ion beam modified polymers are being used at several applications like the increase of biocompatibility of surgical implants [1], food packaging, medical materials, and novel High-Tec materials. A usual way to understand the induced modifications is by studying the stopping power, which contains information about the ion-matter interactions. The kind of modifications depends on the incident ion, energy and fluency of the beam. For polymers, the two main changes usually discussed in the literature are molecular scission and cross-linking [2]. The first one represents the bond breaking while the second one occurs when pending bonds of neighbor chains connect themselves.

Samples of PC and PTFE were irradiated with low and high energies at LIO-IFUSP (Ion Beam Laboratory of the Institute of Physics - USP) and GSI, Darmstadt, Germany, respectively. Water contact angle and FTIR analysis have been done before and after the irradiations to investigate molecular modifications and wettability changes.

PC samples water contact angle analysis has shown a mean value 79.6° with deviation of $\pm 4.7^\circ$. PTFE samples have shown a higher water contact angle (90.23° with deviation of $\pm 1.09^\circ$). A preliminary analysis of samples irradiated with high energy beams has not shown changes from the non-irradiated ones, probably because the high energy beam modifications are well below the surface. The FTIR analysis of PTFE samples has indicated scission of the C-F and C-C bonds and CF_3 formation. Similar tests have been done on PC and PTFE at low energies and different ions.

[1] N. Takahashi, Y. Suzuki et al. "Application of ion beam irradiated PTFE to repair small vessel injuries" Nuclear Instr. Method. **B257** (2007) 114-117.

[2] Fink, D. *Fundamentals of Ion-Irradiated Polymers*, Ed. Springer (2004)