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Gamma and ultraviolet effect on contact angle of polyurethane adhesive derivate from castor oil

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Abstract – Gamma and ultraviolet radiation modify the surface of polymers. The effect of gamma and ultraviolet radiation on the contact angle of a water drop on a polyurethane adhesive derivate from castor oil was investigated. It is observed a significant decrease in contact angle after UVC aging, while a slightly decrease with time exposition at UVA is observed. Gamma radiation does not affect significantly the surface of this material since the contact angle is almost constant for all doses.

Adhesives from biomass not using organic solvents are a tendency nowadays. Polyurethane adhesives derivate from castor oil have the surface modified by incidence of radiation [1]. The contact angle is an efficient method to verify if the polymer surface was modified by the radiation [2].

Polyurethane adhesives derivate from castor oil (CEQUIL - Araraquara –SP) are obtained from a poliol and a pre-polymer. The poliol was synthesized from castor oil which a tri-functional polyester. The pre-polymer was obtained from diphenyl methane diisocyanate (MDI) and prepolymerized with poliol.

The gamma irradiation was applied using a Theratron 780, com atividade de 5 Gy/min at Hospital Erasto Gaertner - Curitiba PR. Doses of 25 kGy and 100 kGy were applied by a cobalto 60 MDS Nordion's JS-9600 source. The source of ultraviolet A (UVA) radiation was a lamp 15 W – 350 BL with radiation peak at 350 nm. Ultraviolet C (UVC) source was a 15 W – TUV lamp with radiation peak at 253 nm.

In the figure 1 it is observed the contact angle as a function of time exposition to UVA and UVC radiation. The contact angle for sample UVA irradiated have a slightly decrease with exposure time. UVC radiation promotes a significant decrease in contact angle for exposition times higher than 200 h. In Figure 2 it is observed that gamma radiation promotes an increase of contact angle at low doses. At doses of 25kGy and 100 kGy the values are similar to the not irradiated sample.

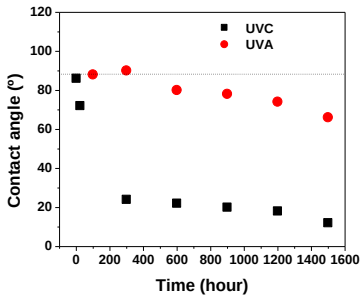

Figure 1: Contact angle of polyurethane adhesive as a function of UVA and UVC time exposition.

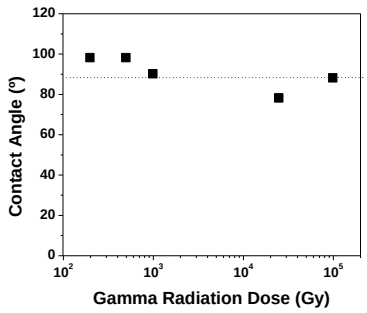

Figure 2: Contact angle of polyurethane adhesive as a function of gamma radiation dose.

References

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