

Characterization of the Virgin and Recycled Ultra High Molecular Weight Polyethylene Irradiated

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The trends of applying Ultra High Molecular Weight Polyethylene (UHMWPE) have been increasing in the last twenty years in its utilization in several industrial sectors. On the other hand, the growth in the utilization of this polymer for the confection of machinery parts has also increased its loss because the rest of the material is disposable, not being reusable. According to the economical point of view, this loss is big, considering that this material is very expensive. In such case, it was studied the possibility of recycling the industrial waste of UHMWPE and afterwards undergo it to the radiation action.

This work is aimed to study UHMWPE resin, its reprocessing by recycling as well as their main properties, before and after irradiation of the virgin and recycled UHMWPE.

It was used virgin UHMWPE UTEC 3041 of Braskem Company, which was recycled afterwards. Both virgin and recycled UHMWPE were irradiated to different doses (100, 300 and 500 kGy) using an electron accelerator. It was performed in this work, trials of: tensile strength (MPa), elongation at break (%), hardness, impact (kJ/m²), modulus of elasticity (%) and wear. In the Table I the results of the studied properties of virgin and recycled UHMWPE non irradiated and irradiated (100, 300, 500 kGy) are presented.

TABLE I: Properties of virgin (V) and recycled (R) UHMWPE non irradiated and irradiated

	V - 0	V - 100	V - 300	V - 500	R - 0	R - 100	R - 300	R - 500
Tensile strength	28	23	21	21	21	19	18	18
Elongation at break	248	96	51	30	122	52	16	13
Impact	185	57	22	17	108	44	22	14
Hardness	64	66	67	68	65	67	68	69
Elasticity Modulus	704	811	848	888	710	822	857	892
Wear	25	46	93	140	26	56	100	120

When the UHMWPE was recycled the properties of tensile strength, elongation at break and impact decreased. However the properties of hardness, modulus of elasticity and wear increased. The virgin and recycled UHMWPE presented the same behaviour in their properties when irradiated with electron beam. It is important to compare UHMWPE properties with the functions it will exert in the final product and with the industrial process which it will undergo to its final form. The UHMWPE could be employed to less noble using, where the presented properties by recycled material lives up to its use.