TITLE: DEGRADATION OF POLYETHYLENE THROUGH A SEQUENTIAL PROCESS PLASMA - *PLEUROTUS OSTREATUS*

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ABSTRACT:

The environmental impact caused by low-density polyethylene (LDPE) waste worldwide, requires the implementation of physicochemical pretreatments that favor the biodegradation of this material.

In this study, a strain of *Pleurotus ostreatus* was used to biodegrade LDPE sheets previously subjected to oxygen plasma discharge (100 % O_2, $3.0x10^{-2}$ mbar, 600 V), for six minutes. To select the conditions that favored the colonization of the fungus and the biodegradation of the LDPE, an experimental Plackett-Burman (PB) design was carried out in a modified semi-solid Radha medium. The best treatment was taken to an experiment for five months in a wet chamber system. The process was monitored through the percentage of colonization, generation of pigments and enzymatic activities lac case (Lac), manganese (MnP) and lignin peroxidase (LiP). The LDPE sheets were monitored through static contact angle (SCA), Fourier transform infrared spectroscopy (FTIR), carbonyl and vinyl indexes (Ico and Iv) and scanning and atomic force microscopy. The results showed that the plasma decreased the SCA by 75.57 % and increased the roughness of the LDPE by 99.81 %, facilitating the adherence, growth, and colonization of *P. ostreatus* (88.72 % vs 45.55 % of the untreated LPDE). The sequential process plasma-fungus to 150 days, generated chemical changes on the material (presence of carbonyl groups and instaurations), high hydrophilicity of the material (SCA = 16.79 ± 4.230 °) and greater activity Lac (2.817 U Lac g^{-1}) and LiP (70,755 U LiP g^{-1}) for day 30, than the treatment without plasma; On the other hand, the highest MnP activity was obtained at day 120 for biological treatment (1097 U MnP g^{-1}). These results suggest the oxygen plasma as a pretreatment that favors the adherence and colonization of the fungus on the LDPE and thus its subsequent partial biodegradation.

Keywords: plasma discharge, *Pleurotus ostreatus*, low-density polyethylene.

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