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Comparison between hexatriacontane and acid stearic behaviours under late Ar-O2 post-discharge.

Euclides Alexandre Bernardelli[1], Thierry Belmonte[2], Fabienne Poncin-Epaillard[3], Ana Maria Maliska[4]

[1]Institut Jean Lamour, Nancy, France [2]Institut Jean Lamour, Department of Physics and Chemistry of Solids and Surfaces, Nancy-Université, CNRS, Parc de Saurupt, CS 14234, Nancy, France [3]Laboratoire Polymères Colloïdes Interfaces, UMR CNRS 6120, Université du Maine, Avenue O Messiaen, Le Mans, France [4]Universidade Federal de Santa Catarina, Laboratório de Materiais, Departamento de Engenharia Mecânica, 88040–900 Florianópolis, SC, Brasil., Florianópolis, Brazil

euclides_ab@yahoo.com.br

Since the pioneer work of Wertheimer et al.[1] plasma treatments are known as allowing etching or funcionalization of long chain molecules during one treatment: loss and gain of mass can be successively observed under constant plasma conditions. The control of the chemical changes in the material is of primary importance. To better understand the interactions occurring between the plasma and the topmost surface of organic materials, we studied in this work the interaction between a late Ar-O_2 post-discharge, where only neutral species are presents, and model compounds: the hexatriacontane (HTC), an alkane ($C_{36}H_{74}$) and the stearic acid (SA), a C_{18} alkane skeleton with an acid function ($C_{18}H_{36}O_2$). For the two compounds treated as thick films, chemical changes depend on the thermal flux released by surface reactions that make the temperatures of the sample and the gas phase drift as a function of time. Since the transformations of the HTC and SA depend on these temperatures, the initial value of this parameter controls the transformation process. In the case of the HTC, when the plasma is used in the continuous mode, we can choose either functionalization or etching by setting the ratio O/O_2 ratio in the post-discharge. Indeed, the reaction mechanisms leading to the etching of the HTC were clarified. In the case of the SA, only functionalization is possible. The difference with the HTC is found to be due to the non-reactivity of the acid group that enables the presence of shorter radicals that are less volatile. The higher mobility of the chains leads also to more efficient reactions of cross-linking. This better understanding of the mechanisms helped us find conditions where the etching of the SA is possible, which is achieved by pulsing the oxygen flow rate below 0.05Hz.

.[1] Wertheimer et al., Nucl. Instrum. Methods Phys. Res. B 151 (1999) 65

Keywords
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