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CLARIFIED POLYPROPYLENE COATED WITH THE A-C: H OBTAINED BY PECVD: RELATION BETWEEN THICKNESS, ADHESION AND SURFACE MODIFICATION OF SUBSTRATE

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Polypropylene (PP) is currently one of the most consumed polymers in the world market. Studies show that the packaging segment is the main consumer of this resin [1]. Despite its rising use, this polymer has limitations that may hamper its applicability in segments that require high transparency and low permeability to gas. The use of PP with nucleating agent (clarifier - PPc) allows to obtain transparent products, but still with high permeability.

One of the alternatives to solve this problem is the use of multilayer polymeric packaging. The major disadvantage of this packaging is the fact that their recycling is impaired, since there is great difficulty in the separation of polymers used in their production, resulting in loss of value of the recycled material. The increase in barrier properties can be obtained by using thin films of the order of nanometers, of hydrogenated amorphous carbon, which are deposited by the plasma process. Due to their thinness, the films do not hinder the recycling process.

The use of thin films of a-C:H in the inner lining of containers of recycled PET was shown, in previous studies [2], to be a barrier to the contaminant migration processes. However, the protection of these films is related to the film thickness and the type of structure that they can provide, which can be diamond like carbon (DLC) or polymer like carbon (PLC), deposited by Plasma Enhanced Chemical Vapour Deposition (PECVD).

This work was performed with a prior treatment of oxygen plasma followed by deposition of the a-C:H samples of PPc. The physical and chemical properties of deposited films were analyzed using tape test (ASTM D 3359-90), contact angle and surface
roughness analysis by atomic force microscopy (AFM). The film thickness was determined by perfilometry.

We conclude that the film a-C:H exhibits a good adhesion with the substrate, when the ideal thickness of the a-C:H is up to 250 nm. We also show that only 30 seconds of pretreatment of the substrate with oxygen plasma is enough to get a more uniform surface roughness and improve the adhesion of film a-C:H on PPc.