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ADHESION PROPERTIES OF PTFE FILMS MODIFIED BY DC DISCHARGEAlla Gilman¹, Michael Piskarev², Michael Yablokov², Alexander Kechek'yan², Alexander Kuznetsov²¹ISPM RAS, Moscow, Russian Federation ²Enikolopov Institute of Synthetic Polymer Materials RAS, Moscow, Russian Federation

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Novel express procedure has been developed for determination of the quantitative adhesion characteristics of the modified surface of polymer films, especially those treated by the low-temperature plasma for vacuum metallization. The procedure comprises deposition of aluminum layer having ~ 100 nm in thickness by means of thermal evaporation of Al in vacuum, making an adhesive joint between Al layer on the film and standard Scotch® 810 tape. Then, T-peel testing of the specimen was performed using Autograph AGS-10 KNG (Shimadzu) universal testing machine at a crosshead speed of 100 mm/min. As a result, a curve reflecting change in the peel resistance (A) along the sample length was obtained. The representativeness of this procedure was established on the basis of the data on the peel strength of two Scotch® 810 tape specimens being joint by their adhesive layers. The A value in this case was 198±5 N/m. The adhesion characteristics were examined for the initial PTFE film of 40 mm thickness and the film modified on the anode and cathode in DC discharge at an air pressure of ~ 13 Pa and a discharge current of 50 mA for 60 s. It was shown that the DC discharge modification substantially increases A, and the highest peel strength of the Al layer being observed for the anode treated film. For the initial film the A value (Scotch® 810/Al) is equal to 78±18 N/m, and for the anode treated film this parameter is 169±15 N/m. The photographs of the specimens of the initial and anode-modified PTFE films after T-peel testing are shown that the Al metal layer is almost completely pulled off by the Scotch® 810 tape from the initial PTFE film but it is fully retained on the anode-treated film. The results obtained show that plasma treatment substantially alters the adhesion properties of PTFE film surface, and the procedure proposed can successfully used for quantitative evaluation of the adhesion characteristics of the surface of plasma-modified thin polymer films.

Keywords

Adhesive properties

PTFE film

DC discharge

T-peel test

Peel strength