

PE2 Polymer surface modification by plasma reaction

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1. Introduction

Surface modification study of the polymer such as Acryl, PC and PET and Glass has been operated by various methodes(1) because of the wide industrial application. The plasma surface modification method obtained by microwave has characteristics of short modification time and high vacuum pressure process and low price. Titanium dioxide thin film on glass panel has been prepared by sputtering method, that has high photocatalytic activity.

2. Experiment

The sputtering machine of batch type used in the our experiment has a microwave source and a cathode. The frequency of microwave is 2.45 GHz and gases used in the process are Ar and O₂. The surface modification effects by plasma obtained from microwave(2) are estimated by contact angle and adhesion test.

Contact angles are measured by measurement system made by SEO. And the contact angle can be changed to the surface energy. The experiment are operated with variation of Ar, O₂ gases pressure ratio, pressure and microwave irradiation time etc. Adhesion test is operated for Ti and TiO₂ thin films coated on the polymer substrate irradiated by plasma.

Batch type degradation experiment for Dye-stuffs performed presence of TiO₂ thin film.

3. Result

We measured the contact angle of polymers irradiated to plasma obtained by microwave in the range (170 sccm / 0 sccm ~ 70 sccm / 100sccm) of Ar/O₂ gas flow ratio . The surface energy of polymer has large tendency as O₂ gas flow is high. Polymers surface energy in the range of 1mtorr ~ 80mtorr is the highest in about 20~30mtorr and surface energy is independent of the gas flow ratio (O₂/Ar : 0~3). We obtained the hysteresis curve of discharge voltage(3) when Ti target is sputtered reactively by using Ar and O₂ gas in dc magnetron method. Excellent adhesion of Ti thin film coated on the

polymer modified by plasma was obtained. TiO₂ thin film photoactivity is 7 times higher than UV-lamp irradiate only.

Reference

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