

UV/ozone irradiation on meta-aramid films

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1. INTRODUCTION

Poly(*m*-phenyleneterephthalamide), meta-aramid is a high performance having resistance to wide range of organic solvents and excellent flame resistance. Synthetic polymer often require high degree of multi-functional properties as well as inherent properties, which are closely related with surface properties such as wettability, antistaticity, antimicrobial property, and biocompatibility. Therefore, various surface modification methods are in use to change relatively inert polymer surfaces. UV/O₃ has been known to be a highly successful method for the surface modification of thermally sensitive polymers and fibers.

This study is to investigate the effects of UV irradiation on surface properties of meta-aramid reflectance, AFM, surface energy. ESCA and ATR were used to characterize chemical compositions of the aramid surface.

2. EXPERIMENTAL

2.1 Preparation of meta-aramid films

A meta-aramid fiber was immersed in DMAc (DMAc/meta-aramid, 100/10, w/w), CaCl₂ (80 wt% of meta-aramid) at 120°C for 4h and stirring. The cast solution film was immersed into a coagulant bath of water and meta-aramid film was drying.

2.2 UV/O₃ treatments

The UV/O₃ treatment of aramid surfaced was performed in a UVO-cleaner (Jelight Co., USA). UV energy was controlled by adjusting UV irradiation time, which was determined by a UV radiometer (EIT Inc., USA).

3. RESULTS AND DISCUSSION

The UV/O₃ treatment effect on subtracted reflectance change of the meta-aramid films was shown in Fig. 1. Higher UV energy resulted in slight yellowing and decreased reflectance at the short wavelength region. The decrease in reflectance may be due to

the destructive interference of roughened surface caused by the photocission of covalent bonds of polymer backbone under UV irradiation. Also the ozone generated under UV light can oxidize the polymer surface. The pronounced decreased in 400nm may be related to the height of surface roughness which can scatter short wavelength of visible spectrum.

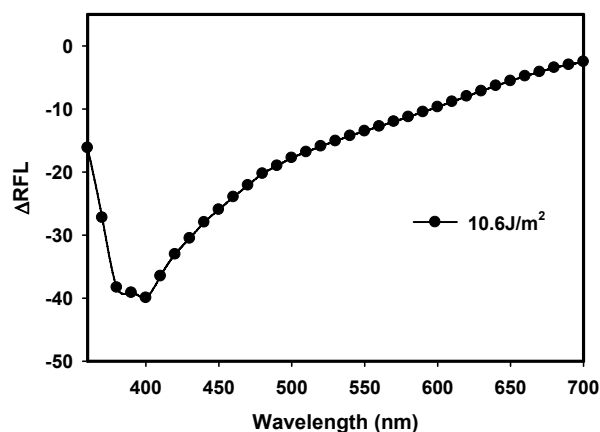


Fig. 1. Subtracted reflectance of UV-irradiated meta-aramid films.

4. CONCLUSIONS

Meta-aramid films surface was modified by UV/O₃ irradiation, and surface properties were investigated by reflectance, ATR, ESCA and surface energy. Upon UV/O₃ treatment, the surface roughness and the O_{1s}/C_{1s} atomic ratio obviously improved, resulting from the implantation of carbonyl and hydroxyl groups.

5. ACKNOWLEDGEMENTS

This research was financially supported by grant No.RTI04-01-04 from the Ministry of Knowledge Economy(MKE)

6. REFERENCES

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