

**The effect of plasma treatment of polycarbonate substrate
on the adhesion of aluminum oxide film**

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PC was treated with ICP, and to increase the polar functional group, a mixture of Ar and O₂ gases was used. The wetting angle was measured at different pressures, ICP powers and plasma treatment times. At certain treatment conditions, the wetting angle showed an extremely low value ($\sim 5^\circ$). In this paper it was tried to find out how the wetting angle was changed by plasma treatment and the result was applied to the deposition of the aluminum oxide thin film ($<1\mu\text{m}$) on PC by ICP assisted reactive magnetron sputtering. It has been found that the wettability is closely related with the total ion energy, i.e., the accumulated ion energy calculated from the ion flux and treatment time. Fig. 1 shows that the wetting angle can be lowered to $\sim 5^\circ$, when the amount of the total ion energy exceeds a certain value ($\sim 100 \times 10^{21} \text{eV}$). Fig. 2 shows the change of the wetting angle with the concentration of polar functional groups (C=O, C-O) calculated from XPS O1s peaks. It was found that the wettability, which influences the film adhesion is closely related with the amount of C=O bonding. And from the surface energy measurement it was also found that the surface energy of the plasma treated PC substrate increased with increasing the C=O concentration. The surface energy was measured by dropping distilled water and diiodomethane using the Owens Wendt geometric mean model [5]. The adhesion property of the aluminum oxide ($<1\mu\text{m}$) film deposited on plasma treated PC was improved when the wettability of the PC substrate was enhanced.

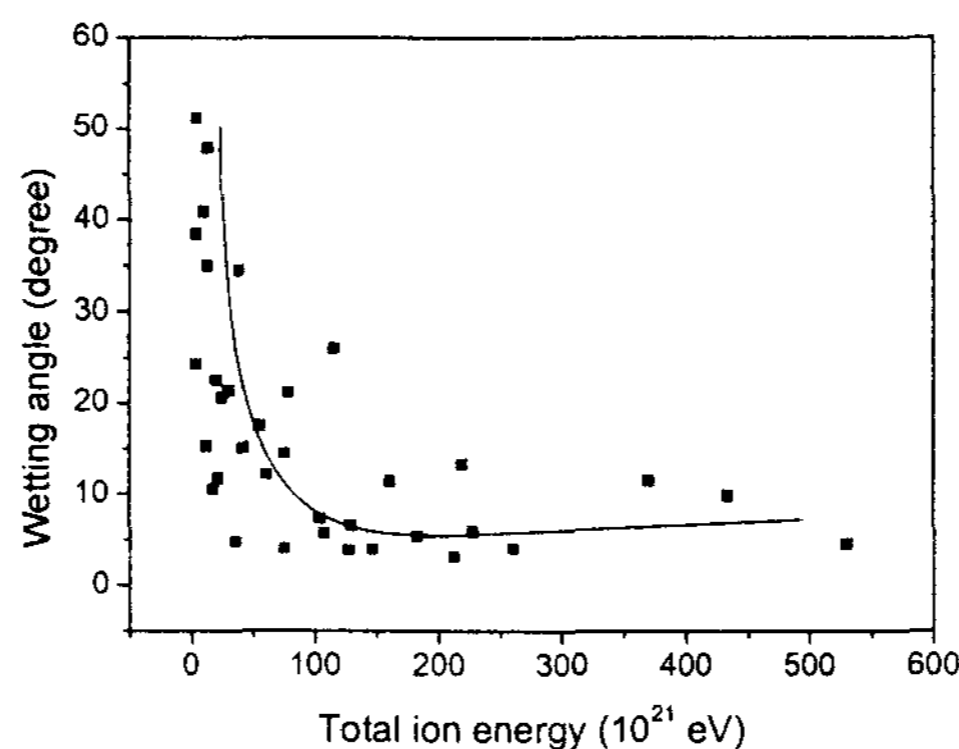


Fig. 1 The wetting angle change versus the total ion energy accumulated from ion flux and treatment time.

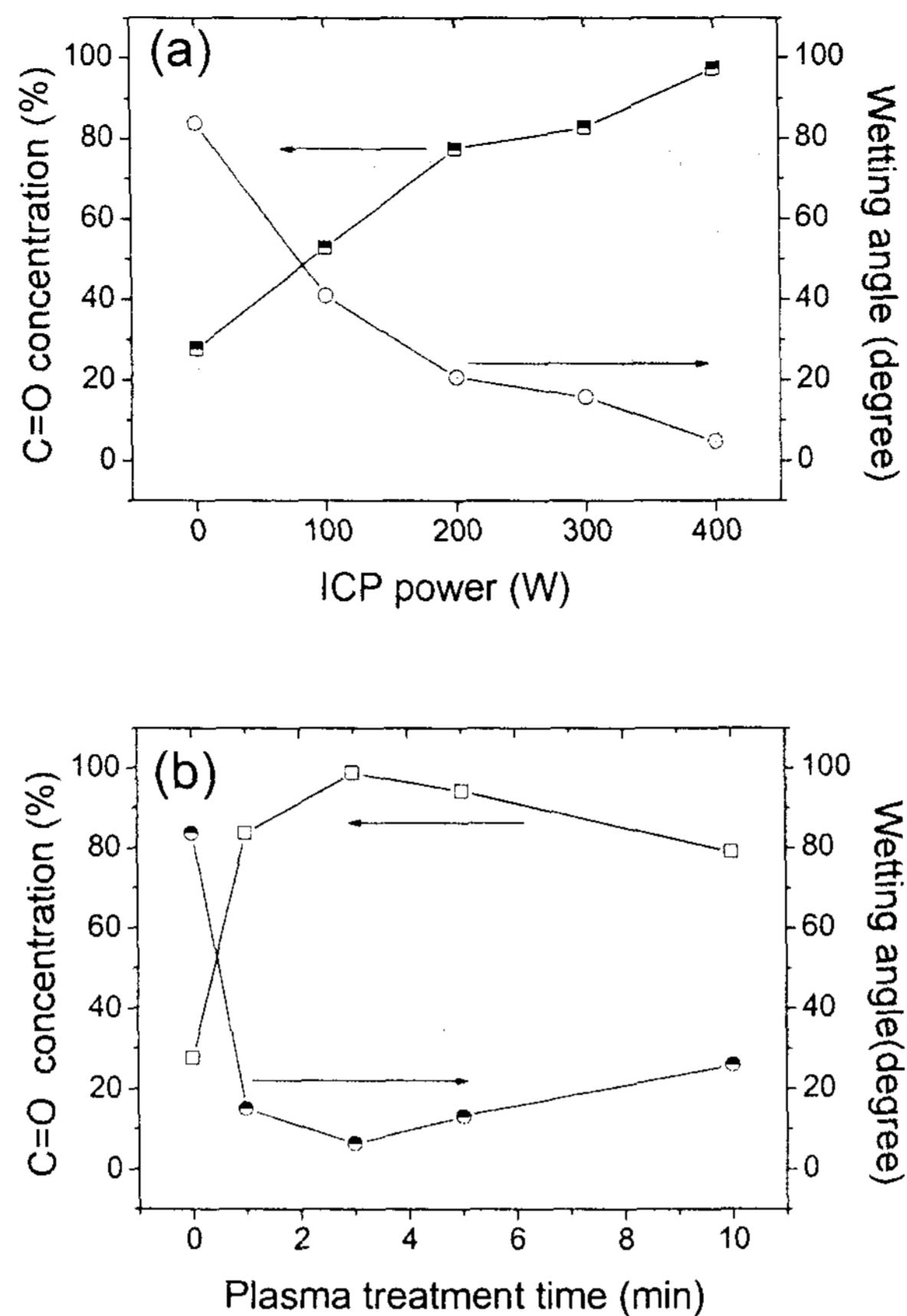


Fig. 2 The changes of the C=O concentration and wetting angle with (a) the ICP power, and (b) the plasma treatment time.

References

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