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Effect of O_2 or H_2 gas addition to Ar gas on surface modification of fluoropolymer using atmospheric pressure plasma: Application for highly adhesive Ag wiring pattern on plasma-treated fluoro polymer

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Data communication volume is drastically increasing with the expansion of the global communication network. For high rate communication, high frequency printed circuit boards made of materials having a highly dielectric property are required. Polytetrafluoroethylene (PTFE) has an excellent dielectric property but poor adhesion property to metal because of its low surface energy. For strong adhesion, PTFE and/or metal surface is roughened to obtain an anchor effect, which induces large transmission loss and low transmission rate. In this study, we aimed to modify the PTFE surface without increasing the surface roughness using atmospheric pressure plasma to improve the adhesion property to Ag ink film. In the case of Ar plasma treatment, the Ag/PTFE adhesion strength was 0.06 N/mm and the color of the PTEE surface changed from white to red-yellow. This coloration was caused by the fluorine-containing deposition on the plasma-treated PTFE surface and it caused low adhesion strength. To avoid the coloration, we added the O_2 or H_2 gas to Ar gas with varying the concentration (≤3%). In the case of Ar+O_2 plasma treatment, the coloration decreased with increasing the O_2 concentration but the Ag/PTFE adhesion strength decreased to 0.0 N/mm. In the case of Ar+H_2 plasma treatment, the coloration did not occur. In addition, the Ag/PTFE adhesion strength increased to 0.55 N/mm when H_2 concentration was controlled at 0.5%. We realized the prevention of coloration and increase in the Ag/PTFE adhesion property upon control of H_2 gas concentration in Ar gas.

Biography

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