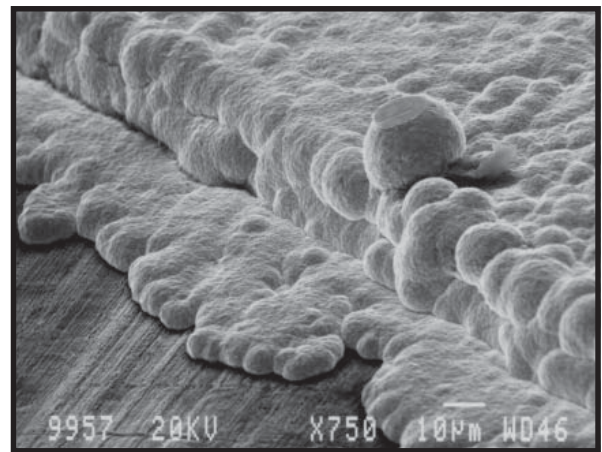
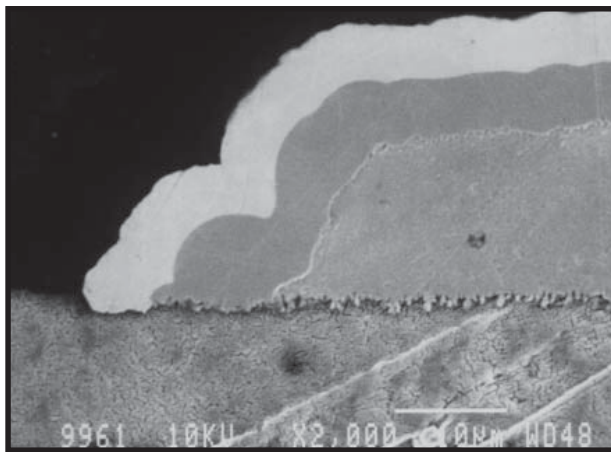


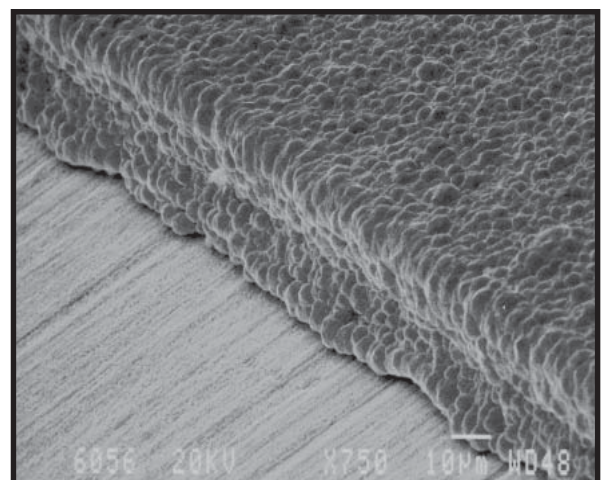
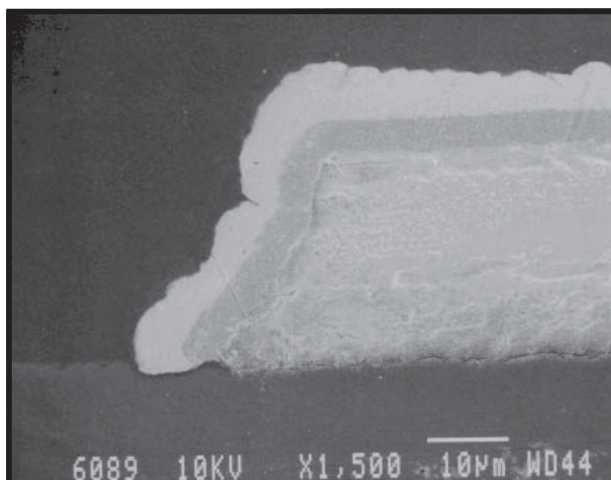
The Prevention of Extraneous Secondary Plating of RT/duroid® High Frequency Laminates

Introduction:

RT/duroid® laminates encompass both polytetrafluoroethylene (PTFE) and ceramic filled PTFE dielectric materials. During the fabrication of circuits from these materials, it is often necessary to introduce additive plating such as copper, tin/lead, nickel and gold to the etched traces. Occasionally these secondary platings have been shown to cause extraneous plating at the copper trace edge as shown in the following photos:



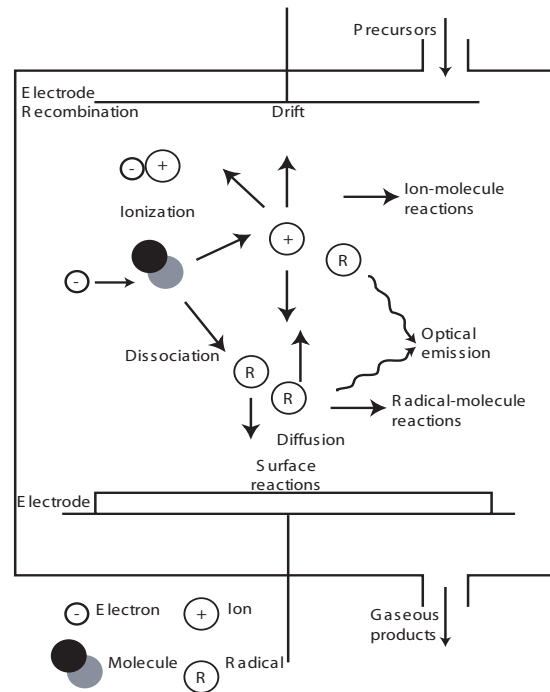
Plasma treatment of the dielectric surface has been shown to be an effective tool to minimize this unwanted plating as seen in the following photos of the same material configuration as above:



What is Plasma:

Plasma is a partially ionized gas containing electrons, ions, free radicals and other excited species. This very reactive environment can be generated by RF excitation under vacuum conditions.

The low bombardment of the substrate surfaces with these electrically charged gases results in a chemical reaction with the substrate. The variety of chemical reactions that can be obtained by gas selection or gas blending offers a distinct advantage in the manufacturing of complex printed circuit panels with different materials. For example, a distinct plasma process can etch the epoxy portion in an FR4/PTFE multilayer board while a different plasma composition can treat the PTFE for subsequent plating for plated through holes. In the case of extraneous plating of the dielectric by unwanted secondary plating components, the plasma process is believed to ablate any residual bonding sites on the etched dielectric in close proximity to the trace edge. By removing the bonding sites that may be latent to the dielectric next to the traces, minimization and/or elimination of the extraneous plating is possible.



Guidelines for Plasma Processing:

Plasma processing, for the most part, like drilling is a batch type process. The equipment involved encompasses a vacuum chamber, radio frequency (RF) power supply, electrodes (RF antenna), vacuum system, gas flow controls and control device.

The printed circuit panels are placed between electrodes in the plasma chamber and the chamber is evacuated to a pressure <100 mtorr. Depending on the desired chemical reaction, the gas or gas blend is injected into the chamber and the operational pressure is stabilized to the prescribed setting.

The radio frequency power supply is then energized resulting in a discharge across the electrodes converting the gas molecules into electrons, ions, free radicals and recombined molecules. These species bombard the surface of the printed circuit panel providing the ablating or etchback properties required to prevent extraneous secondary plating. Once the reaction dwell time has expired, the chamber is purged with inert gas and brought back to atmospheric pressure. The panels are then removed and continued through the manufacturing process.

The table below represents the plasma treatment conditions to be followed for effective minimization/elimination of extraneous plating:

Table 1: Plasma Process Conditions

| | |
|-----------|---------------------|
| Gas: | 100% O ₂ |
| Pressure: | 250 mtorr |
| Power: | 2000 watts |
| Time: | 20 minutes |

Additional Discussions:

The use of plasma treatment in the prevention of extraneous plating has been shown to be effective in cases where the defect is observed. The downside to the defect is that there is no current capable method of predicting the probability of extraneous plating until it occurs. As a preventative measure, initial proper processing techniques employed during the imaging and etching portions of the fabrication process will yield traces with maximum perpendicular wall profiles with little or no residual metals latent to the etched dielectric. Strict adherence to manufactures recommendations for photo imaging materials and removal as well as copper etching solutions should be undertaken in order to minimize the probability of secondary plating problems.

The information contained in this fabrication note is intended to assist you in fabricating Rogers' laminates. It is not intended to and does not create any warranties, express or implied, including any warranty of merchantability or fitness for a particular application. The user should determine the suitability of Rogers' circuit materials for each application.

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