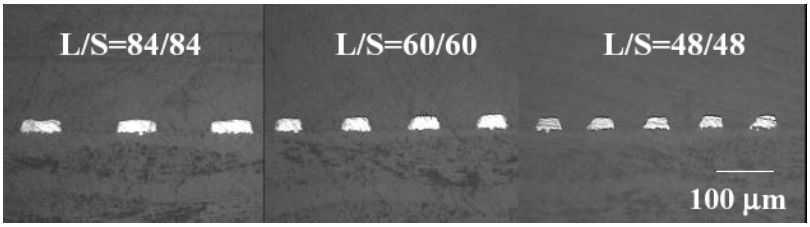
Through Mask Etching for Printed Circuit Boards using the FARADAYIC® Process

Objective:

This project demonstrated the feasibility of using the patented FARADAYIC® Process for through mask etching of copper to fabricate small features, such as conductor lines and bond pads, on large printed circuit boards (PCBs).



Summary:

The FARADAYIC® Etching Process is an electrically mediated process that involves applying a voltage between the printed circuit board and a counter electrode to electrochemically remove the copper not covered by the photoresist mask. The voltage is periodically interrupted to improve the current distribution and provide fast vertical copper etching rates while minimizing the lateral copper etching rates underneath the photoresist mask. FARADAYIC® Etching utilizes a nonaggressive bath chemistry to enable highly controlled process start and end points, and produces features with lower undercut values as well as better etching ratios for varying size features on PCB test vehicles when compared with DC and spray etching. Shown are cross-sectional photographs of the conductor lines varying in size from 48 to 84 µm resulting from FARADAYIC® Etching. Faraday designed and built a pilot-scale electrochemical cell that accommodates PCB and packaging panels as well as wafer substrates.

Background:

The patented FARADAYIC® Process is an electrochemical manufacturing technique that utilizes a controlled electric field for etching, polishing or shaping a metallic work piece. Since the FARADAYIC® Process is electrically mediated, it does not require aggressive chemicals to facilitate the metal removal as needed in conventional chemical processes (e.g. chemical etching). The material removal rate is determined by the applied electric field, which is user-defined and computer controlled. This provides the means for precise control of the length of the process and the total material removed. Additionally, the use of neutral salt solutions (e.g. sodium chloride and sodium nitrate) as the electrolyte makes the process both worker and environmentally safe.

The FARADAYIC® Process technology illustrated above is protected by a substantial patent portfolio including issued, allowed, and pending patent actions.

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