

Removal of SU-8 Photoresist for Thick Film Applications II: Dry Techniques

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SU-8 photoresist has consistently shown superior images for thick film lithography but has several drawbacks. The highly crosslinked epoxy resulting from the lithography process is difficult to remove reliably and without damage to electroplated metals. In this paper, we discuss successes and failures of a variety of dry removal techniques. First, burning the material in air can be readily utilized and is fast and inexpensive, but the approximately 600° C temperature induces grain growth and weakens the electroplated parts. This temperature can be lowered considerably to approximately 450°C with the introduction of controlled burning such as performed by Pollution Control Products (Dallas, TX). These techniques, while inexpensive and reliable are still too high of a temperature for some applications. Reactive Ion Etching (RIE) has been somewhat successful, achieving etch rates of up to 4 µm/min. using special, isotropic etchers with high gas flow rates. However, our experience to date has been that particularly thick films (≥ 200 µm thick) or high aspect ratios are difficult to remove in this fashion. Down stream chemical etching (DCE) performed at Matrix Technologies (Richmond, CA) has been particularly effective in removing SU8 films. Etch rates as high as 10 µm/min. for 350 µm thick films have been achieved at a controlled wafer temperature of 275°C. In addition, the highly isotropic behavior of the process gasses ensures complete removal of the patterned photoresist. Auger spectroscopy coupled with sputter depth profiling of the remaining Ni and NiFe parts after DCE removal shows clear evidence of residual catalyst from the large amounts of SU8 removed. Mechanical testing of the resultant parts will also be presented and compared to parts that have not been subject to the oxidative or high temperature conditions.

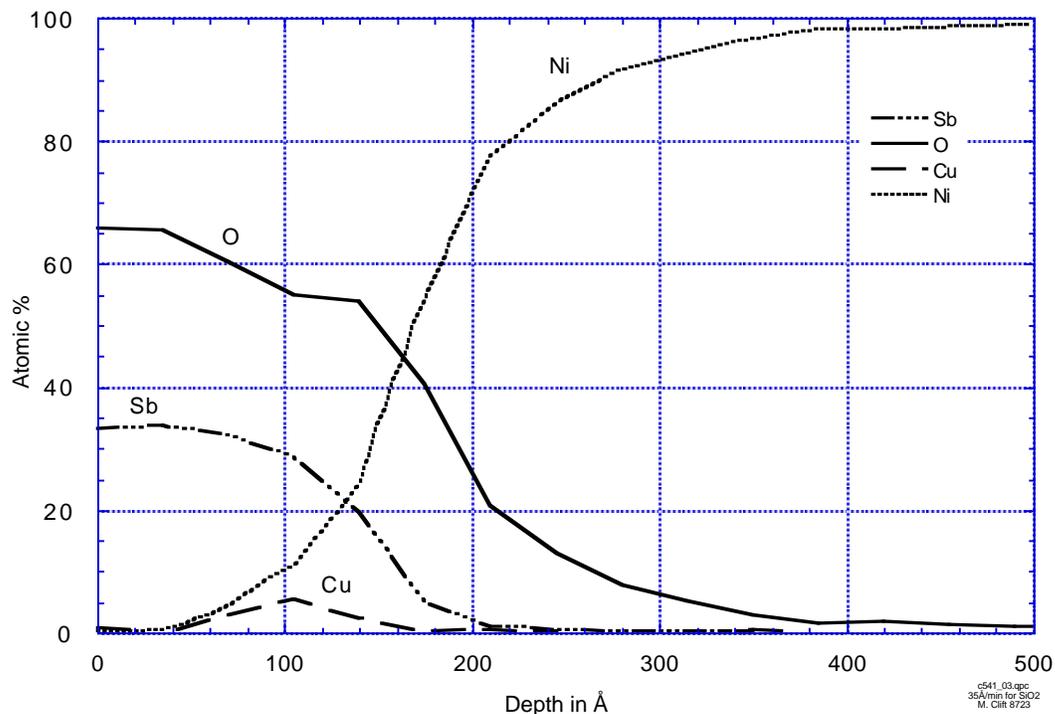


Figure 1: Sputter Auger results of 300 μm thick Ni parts plated in SU 8 mold and subjected to 35 min. of down stream chemical etching for removal of SU8. The removal rate was approximately 10 $\mu\text{m}/\text{min}$. at 275°C and using 2% CF_4 in the gas mixture. The Antimony left on the parts is from the catalyst in the SU 8.