Garbage in = Garbage Out

Effects of Elevated Bromide on the Qualification Process

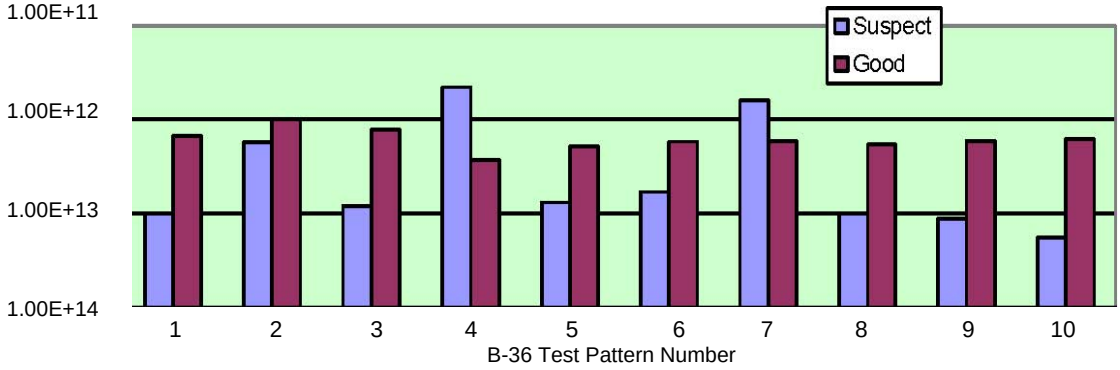
Foresite Inc.

In this case study, we examined the effects of elevated bromide from the fabrication process on an assemblers qualification process. The assembler had a standard process based on RMA flux with semi-aqueous cleaning. A subcontractor desired to use water-soluble fluxes with aqueous cleaning. The commercial products were intended for a marine environment. The assembler decided that the process qualification scheme of J-STD-001A Appendices D and F, would be a reasonable gauge of the subcontractor's ability to manufacture product with the alternative process. The B-36 boards were obtained from a contract fabricator, with tin-lead coated (HASL) metallization, in order to be more representative of actual product. No pre-cleaning of the B-36's was performed.

Poor Performance: Operator Error or Residue?

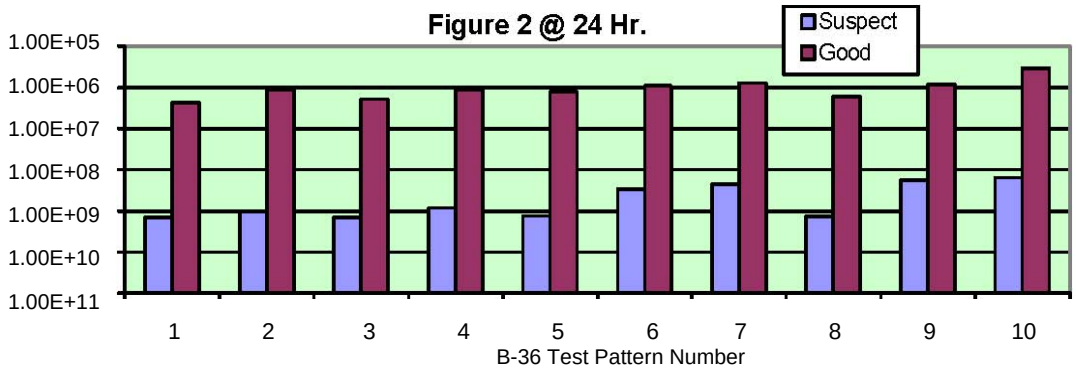
In the initial round of SIR tests, poor performance was noted for the candidate process boards, the baseline RMA process boards and the controls. After determining that the failures were not due to chamber faults or operator errors, the performance of the control boards suggested a fabrication residue. Figures 1 and 2 show some of the SIR characteristics of the control boards (suspect boards) against the performance of control boards from another vendor (good boards).

Figure 1 Initial



- The suspect and good boards had comparable SIR levels at initial ambient conditions. No faults would be noticed at this point.
- The 24 hour readings (@85ºC & 85%RH) for the good boards were what we consider acceptable performance and typical of a clean board B-36 board and use these levels as a reference.
- The 24 hour readings for the suspect control boards were significantly lower, failing J-STD-001A criteria. This poor performance continued for the remaining measurement sets.

Figure 2 @ 24 Hr.

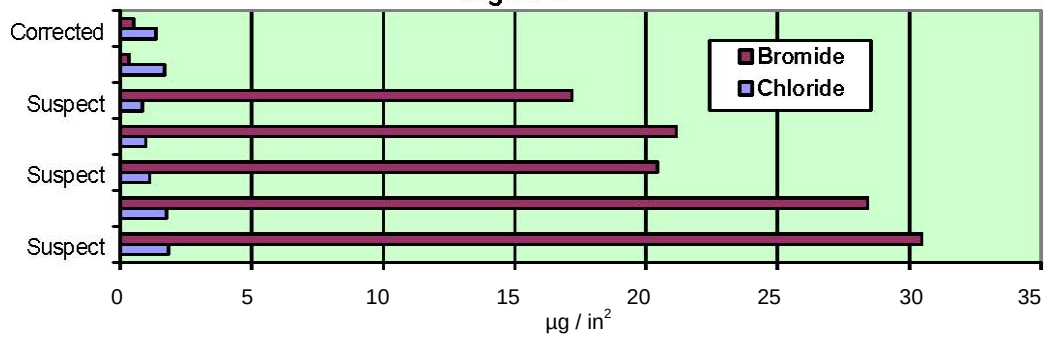


1982 S. Elizabeth St. • Kokomo, IN 46902 • 765.457.8095 • www.residues.com • ForesiteInfo@residues.com

If the control boards had exhibited acceptable SIR levels, then the examined assembly processes would have been suspected. Since the suspect control boards universally failed, it was apparent that an underlying residue affected the results.

Additional B-36 boards were fabricated using the suspect process. Ion chromatography was performed on the unprocessed boards (as fabricated). Figure 3 shows the general levels of ionic residues found.

Figure 3



- The chloride levels on the process boards were relatively low, but the levels of bromide were unacceptably high. The source was the bromide-activated flux used in the HASL process.
- Bromide levels of 0-4 micrograms per square inch could be attributable to the fire retardant in the FR-4 laminate. The remainder was flux residue.
- The fabricator was encouraged to try an alternative flux in the HASL process which did not contain high levels of chloride or bromide. Figure 3 shows the effects of this change in the columns marked “Corrected”.

Conclusion

After the implementation of the alternative flux in board fabrication, SIR performance improved dramatically. The new B-36 boards performed as denoted in Figure 1. “Good” controls. The customer was able to accurately test the baseline and candidate processes without the background effects of the process residues.