Scientific
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TESTING — CONSULTING

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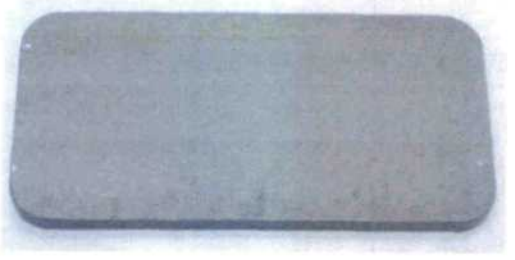
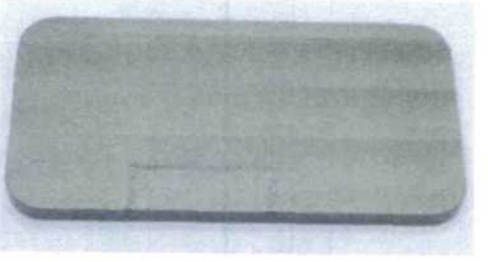
Lab No.: 2007030487
Inception: Mar. 27, 2006
Test Type: **Consultation/Investigation** **Report Date:** Apr. 2, 2006

SAMPLE IDENTIFICATION:

Three (3) samples, hardcoat anodized aluminum. Two samples were coupons identified as K100 and C250 (5000 series cast alloy). The third sample was an actual part made of MIC-6 (7000 series) cast alloy.



K-100



C250

MIC-6

FOREWORD:

The MIC-6 alloy part is one of about a 25% reject rate obtained from similar parts after hardcoat anodizing. These rejects evidence a severe burning/chemical attack to the point where the aluminum is perforated (see photo above). The two coupons made for an alternate alloy were submitted for comparison purposes, as parts made from these alloys undergo the same anodizing process and do not evidence the problem.

The purpose of this investigation was to determine what, if any, differences there were between the 5000 series coupons and the MIC-6 part that might explain the different

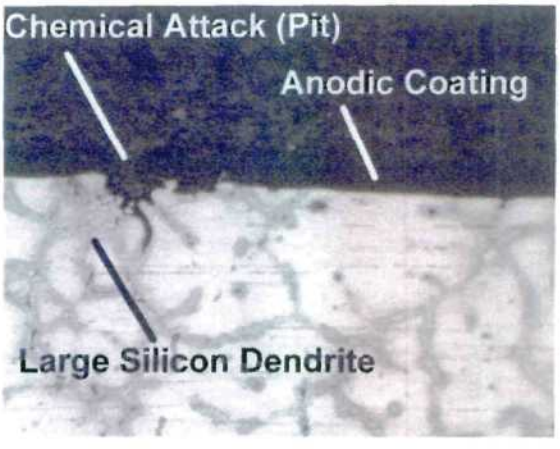
26

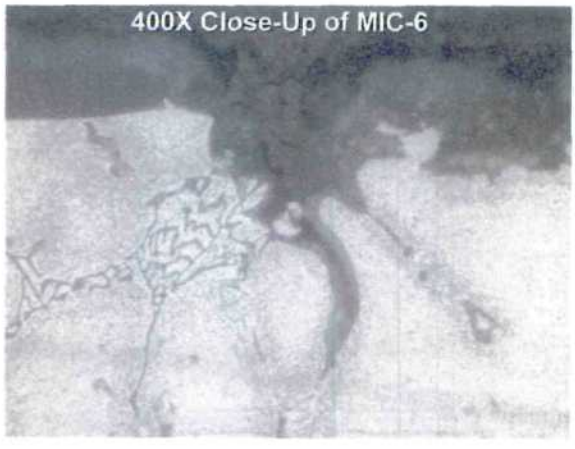
results.

PROCEDURE:
We cross sectioned portions from each submitted sample, mounted the sections in Bakelite, polished the sections and chemically etched the aluminum to reveal the structure.

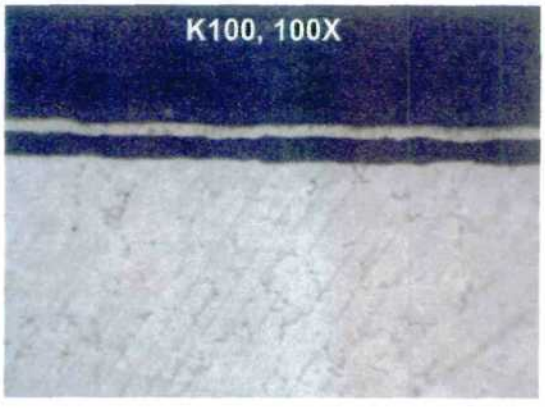
RESULTS:

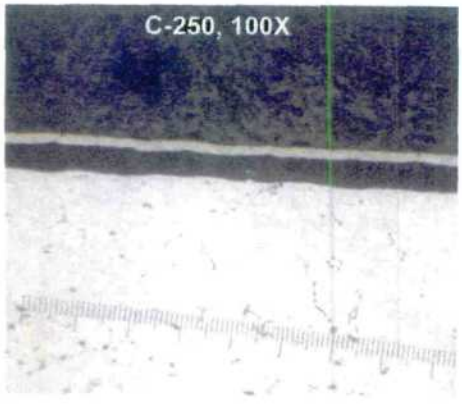
The MIC-6 part had a very porous structure with large portions of the aluminum evidencing dendritic silicon inclusions. The 500 series coupons had far less porosity and no large dendritic silicon inclusions as shown in the photos below. Since silicon does not conduct electricity, large amounts of secondary phase silicon can produce localized resistance heating. This combined with the high level of porosity results in aggressive localized attack of the aluminum during the anodizing process.





MIC-6 Sample Cross section at 100 and 400X





K100 and C250 Cross sections at 100X. Note significantly different structure.

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COMMENTS/CONCLUSIONS:

The K-100 or C250 alloy coupons have a more sound microscopic structure that lends itself to hardcoat anodizing, while the part made of MIC-6 will result in a high level of reject rates due to the high level of porosity and presence of large localized silicon dendrites. This is a material problem that can not be resolved by changing the anodizing process.

Respectfully Submitted,

Scientific Control Laboratories, Inc.

FA:fa

Frank Altmayer

28