SERMA TECHNOLOGIES

ANALYSIS ON EXTERNAL LEADS OF DPD DIODES FROM HAMAMATSU
REPORT E02P1865 - JANUARY 13, 2003

This analysis was performed for :

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INTRODUCTION

Nineteen (19) DPD diodes from *HAMAMATSU* (lot 2B) were submitted to SERMA Technologies for an analysis of the external leads.

Corrosion is suspected at the KOVAR basis material to NiP layer interface of these leads (defect previously observed on the report E02P1638 - November 12, 2002).

The DPD diodes were referenced : 330, 331, 333, 335, 336, 339, 340, 342, 343, 345, 346, 348, 349, 351, 352, 353, 355, 357 and 358.

CONCLUSION

* Two corrosion points were detected on one lead (lead 1) of the DPD diode referenced 345 after Au layer removal (it did not concern the same lead that on the previous report). This corrosion was located at the KOVAR / NiP layer interface.

* This corrosion occurred during the ceramic package manufacturing before the NiP and Au layer deposits on the leads.

ANALYSIS PROCEDURE

- External inspection of the whole DPD diodes,
- Au layer removal from the leads (two DPD diodes),
- Optical inspection after Au layer removal (two DPD diodes),
- SEM inspection after Au layer removal (one DPD diode).

ANALYSIS RESULTS

- A general view of one part with leads reference is shown in Figure 1.
- A few Au layer discolourations were observed on one lead of the DPD diodes referenced 336, 345, 346 and 358 (Figures 2 and 3).
- Au layer was chemically removed (Au etch solution) from the leads on the DPD diodes referenced 345 and 358. No anomaly was detected at the discoloured areas previously observed.
- Nevertheless, two corrosion points were observed on one lead of the DPD diode referenced 345 (Figures 4 to 6).
  KOVAR basis material was visible on one corrosion point.
  O element was detected at the corrosion level (Figure 7).

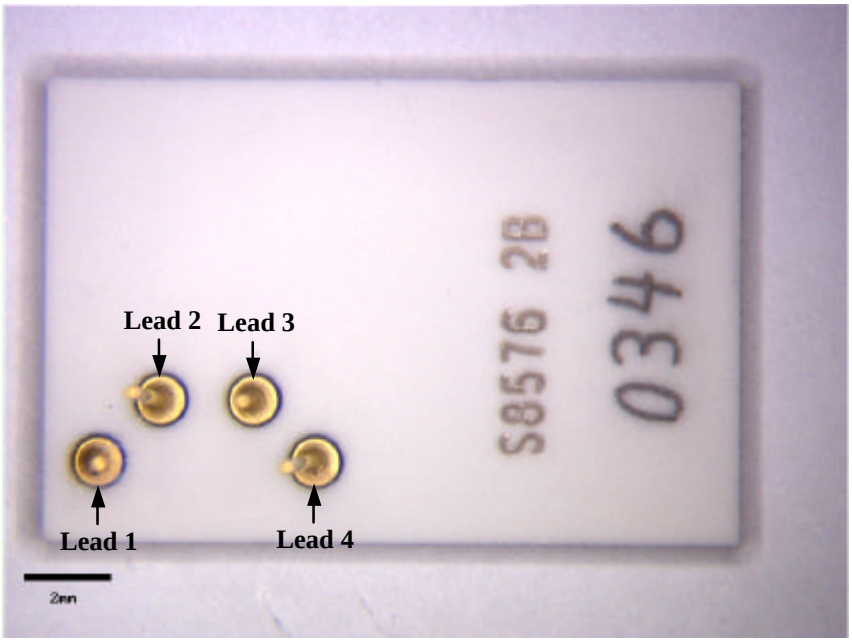
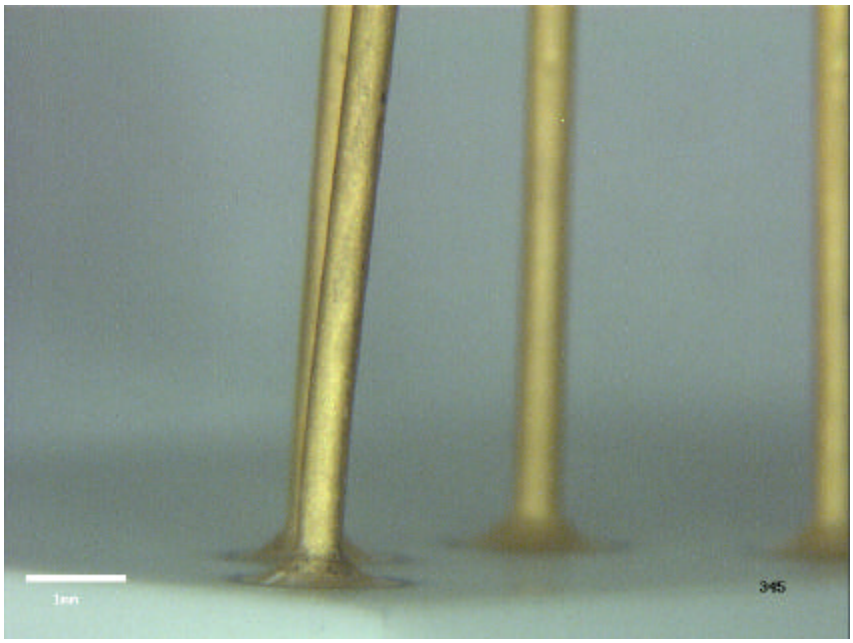


Figure 1. General view of one DPD diode, Part 346, mag ≈ 5X.



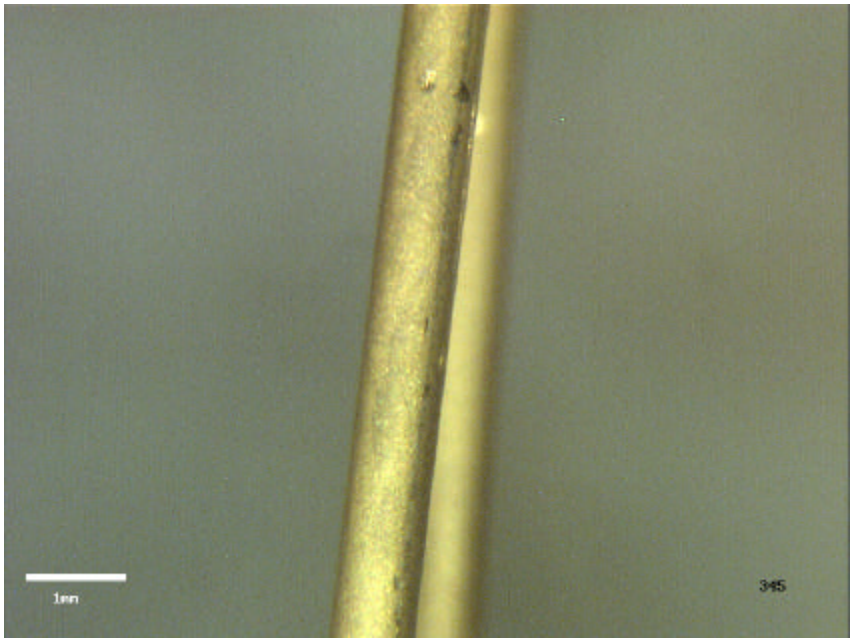
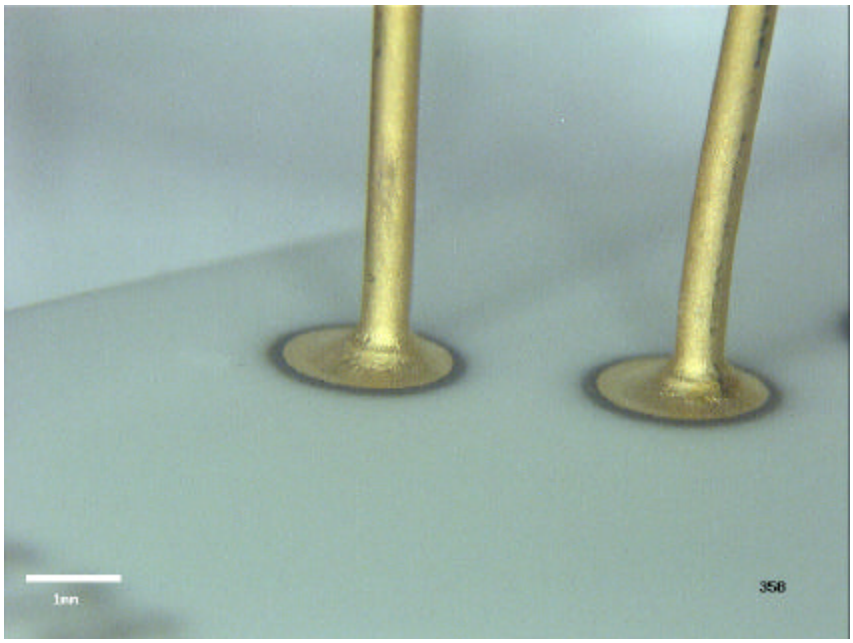


Figure 2. Optical views of external leads, Part 345.
Top : mag ≈ 15X ; bottom : mag ≈ 30X.



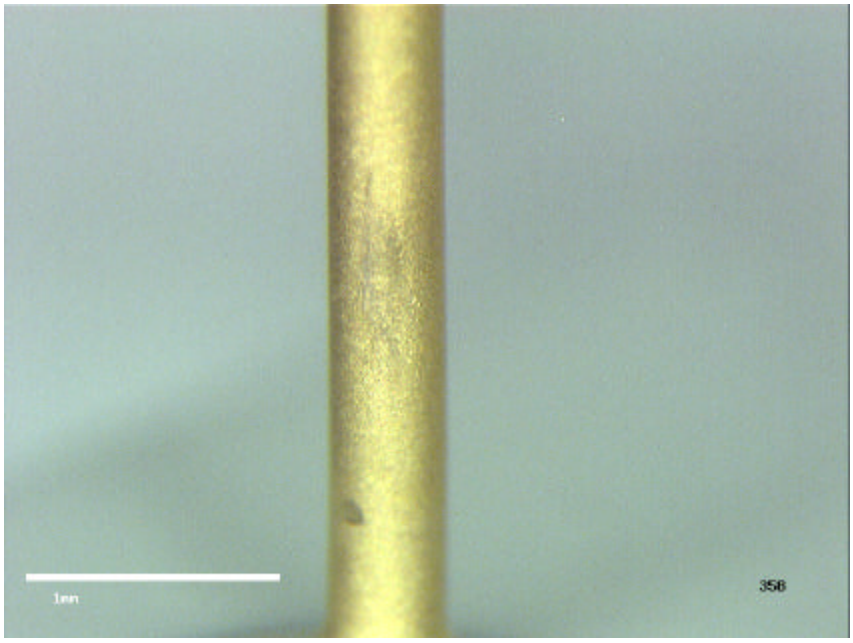


Figure 3. Optical views of external leads, Part 358.
Top : mag ≈ 15X ; bottom : mag ≈ 35X.

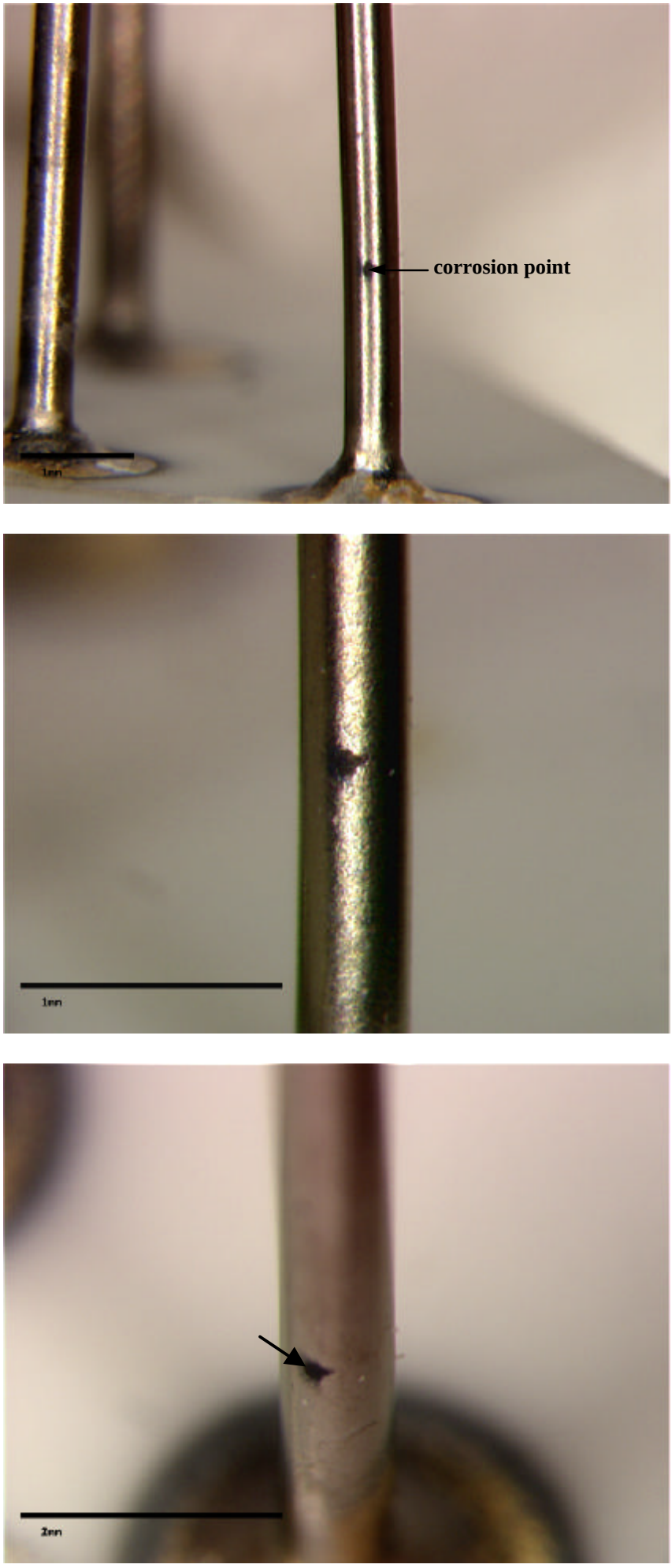
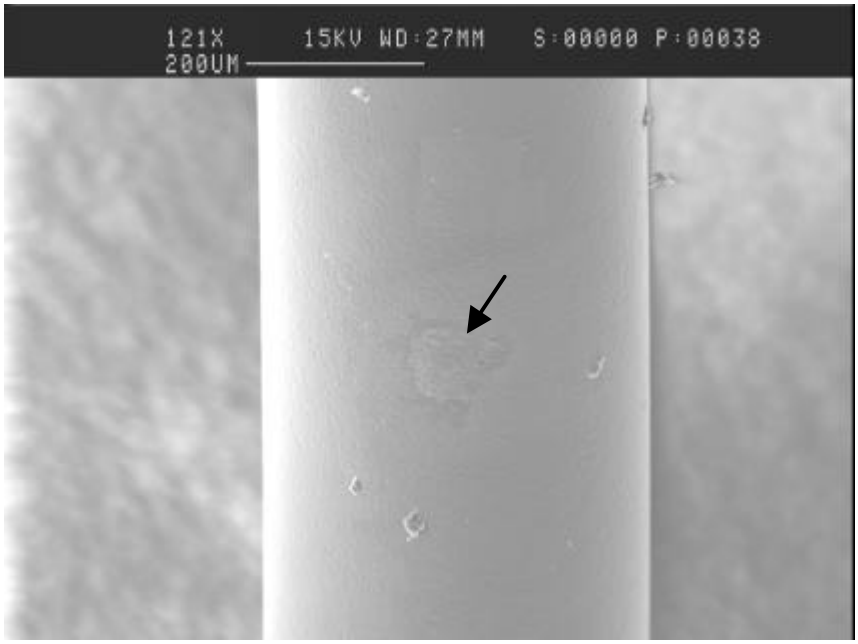
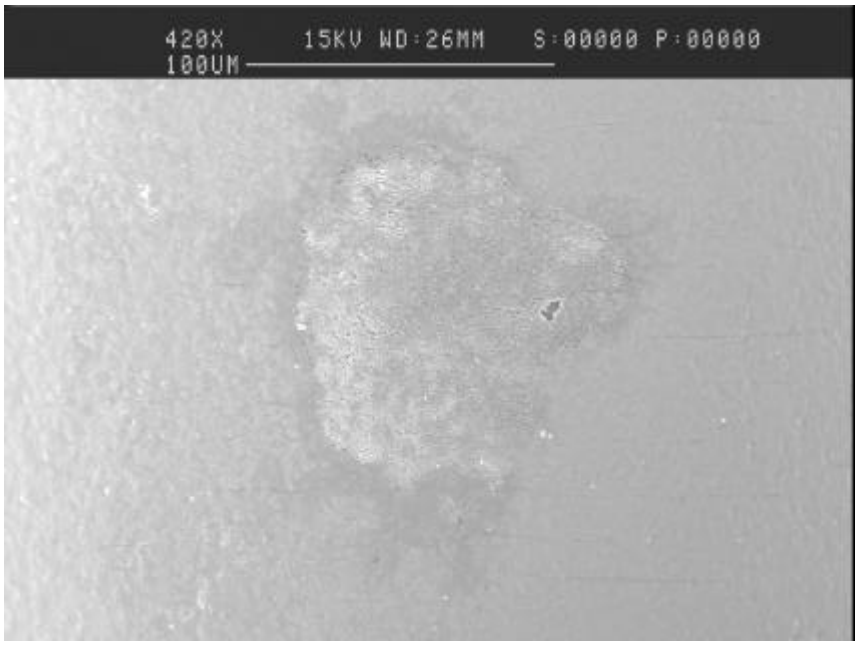
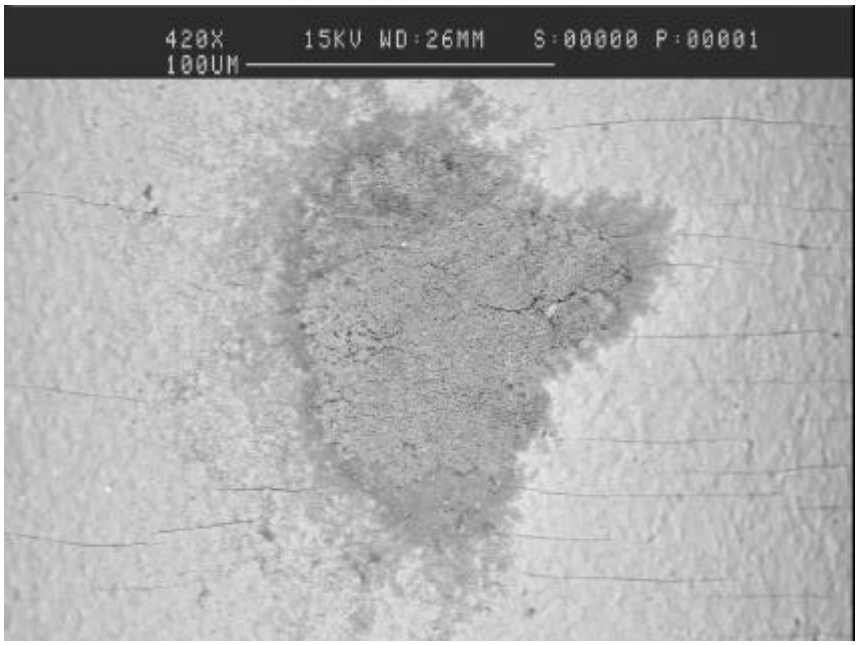


Figure 4. Optical views of external leads after Au layer removal, Part 345.
Top : mag ≈ 21X ; center and bottom : mag ≈ 45X.

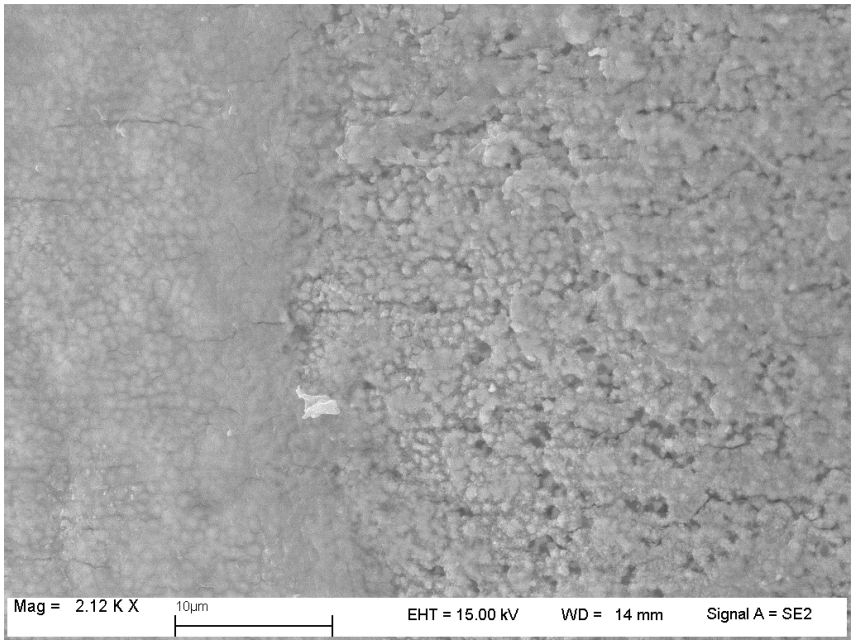


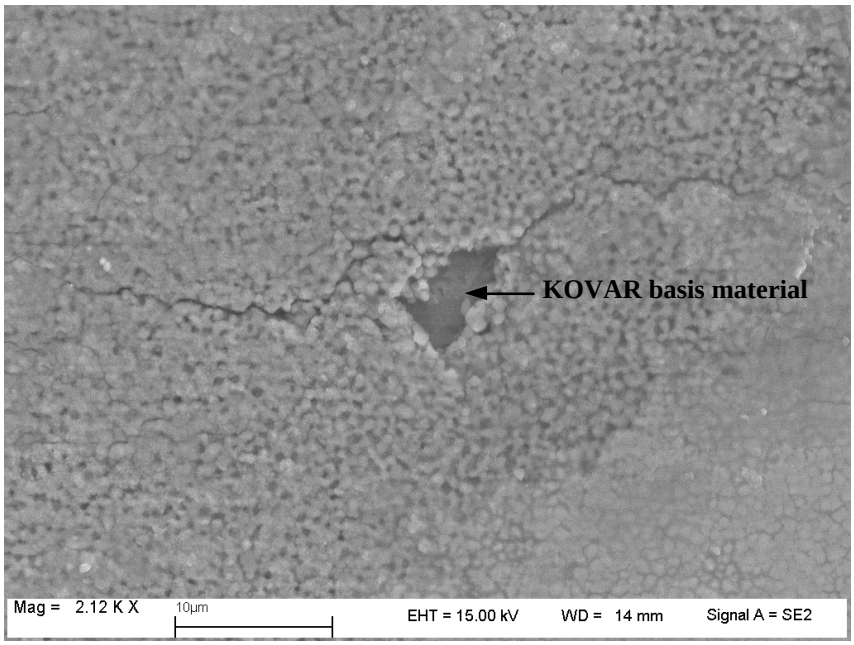




BSE VIEW

Figure 5. SEM views of one lead (lead 1) after Au layer removal, Part 345.
Top : mag ≈ 121X ; center and bottom : mag ≈ 420X.





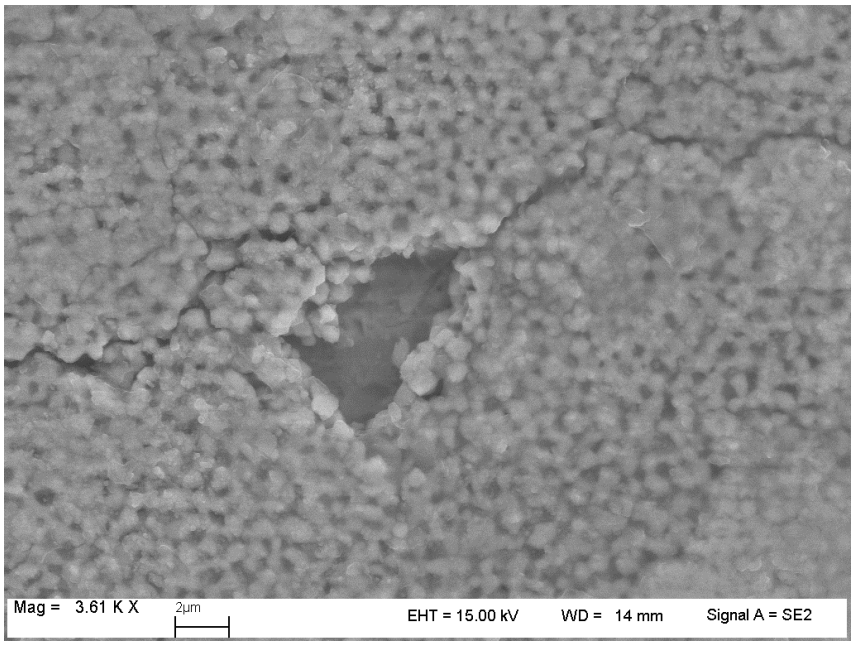


Figure 6. SEM views of one lead (lead 1) after Au layer removal, Part 345.
Top and center : mag ≈ 2120X ; bottom : mag ≈ 3610X.

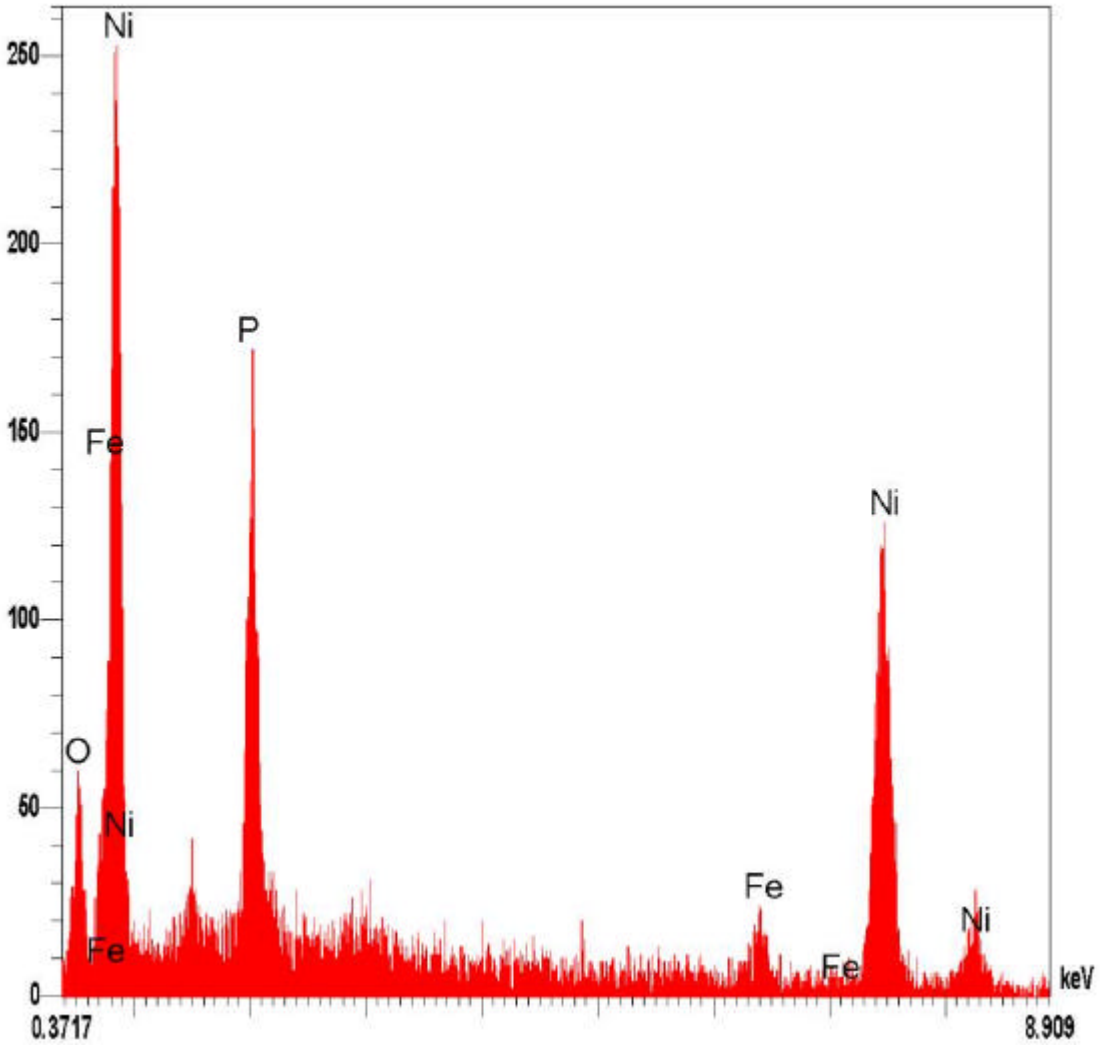


Figure 7. EDX analysis spectrum of the corrosion point.