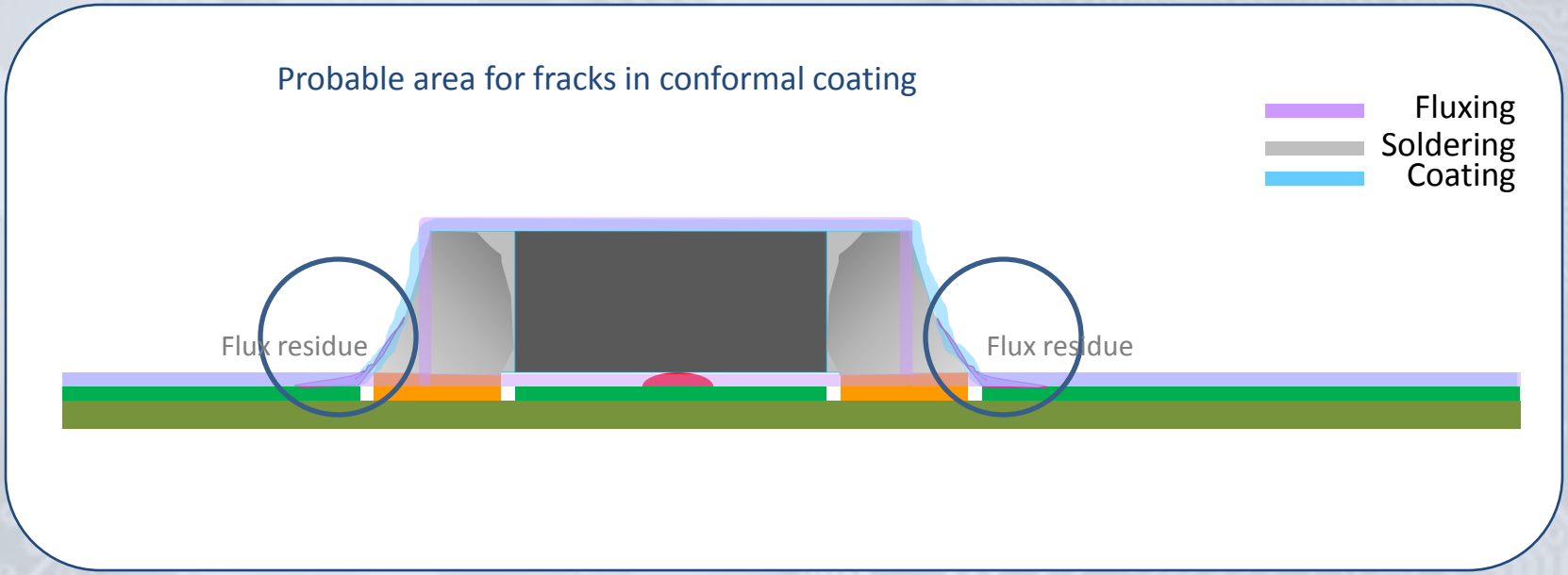
INTERFLUX® Electronics N.V.

Conformal coating on No-clean fluxes

Conformal coating and adhesion

Flux residue may promote cracks in coating due to adhesion problems and CTE mismatch



Application on cleaned boards or uncleaned boards?

Cleaned boards	Uncleaned boards
PRO: • Good coating adhesion • Higher reliability	**PRO**: • No extra process step • No extra process time • Less costs
CONTRA: • Extra process step • Extra cost, longer process times • When cleaned, clean very well	**CONTRA**: • Possible bad adhesion of coating • Lower reliability

Can we eliminate these contras?

No-clean flux chemistry

- designed to be safe when not cleaned (**S**urface.**I**nsulation.**R**esistance. – **E**lectro **C**hemical **M**igration, ...)
- hydrophobic - very low to no interaction with water (humidity)
- fluxes often contain **Ro**sins, **Re**sins, waxes, ...
- therefore quite difficult to clean (water based cleaning)
- when clean, clean completely or situation could be worse compared to the un cleaned situation (uncovered substances, free halides, ...)

No-clean flux chemistry

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Can we eliminate these contras?

No-clean flux chemistry

Is there anything more advanced than No-clean flux chemistry?

A flux technology that does not need to be cleaned and leaves virtually no residue?

Yes, and it is called:

"**No-Residue**™ technology"

No-residue™ technology flux

- ingredients that can evaporate completely at normal process temperatures
  NO **Re**sins, **Ro**sins, waxes , ... are used
- T < 160°C solids start to go in a liquid phase and then evaporate
- when operated well, one can achieve a residue-less post solder situation

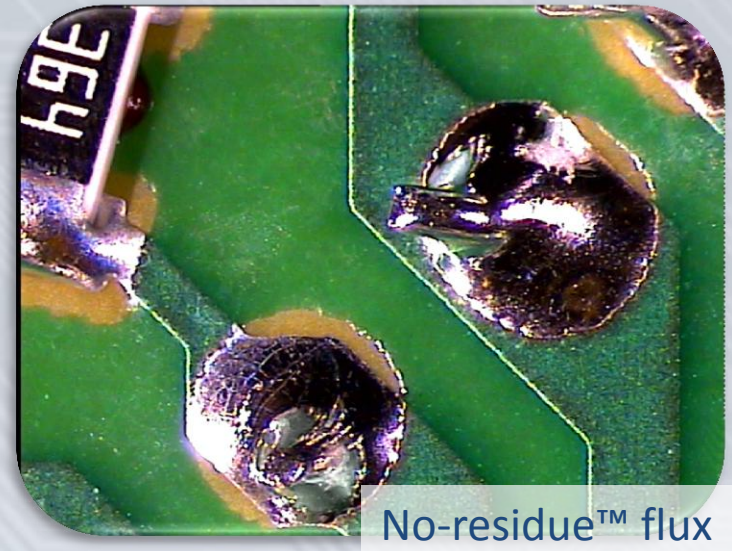
Film evaporation of IF 2005C on glassplate

evaporate completely < 160°C residue-less situation

No-residue™ flux

No flux **residue** means:

- better conditions for adhesion of conformal coating
- (flux) cleaning not necessary
- better board reliability and board cosmetics
- process requirements slightly more critical



No-residue™ flux

No-clean flux

But what if the **conditions** for a **No-residue™** situation are **not met**?

- flux residue on the board

Is this a problem?

Two examples of test results for selective soldering.

Flux **corrosion** test
IPC TM 610D class 3
Automotive rank 1
classification for global system's supplier

Migration & **corrosion** test
modified test conditions J-STD-004
EN 61109-1-1

Fraunhofer IZM Institut Zuverlässigkeit und Mikrointegration

ZVE

Flux **corrosion** test

IPC TM 610D class 3

Automotive rank 1

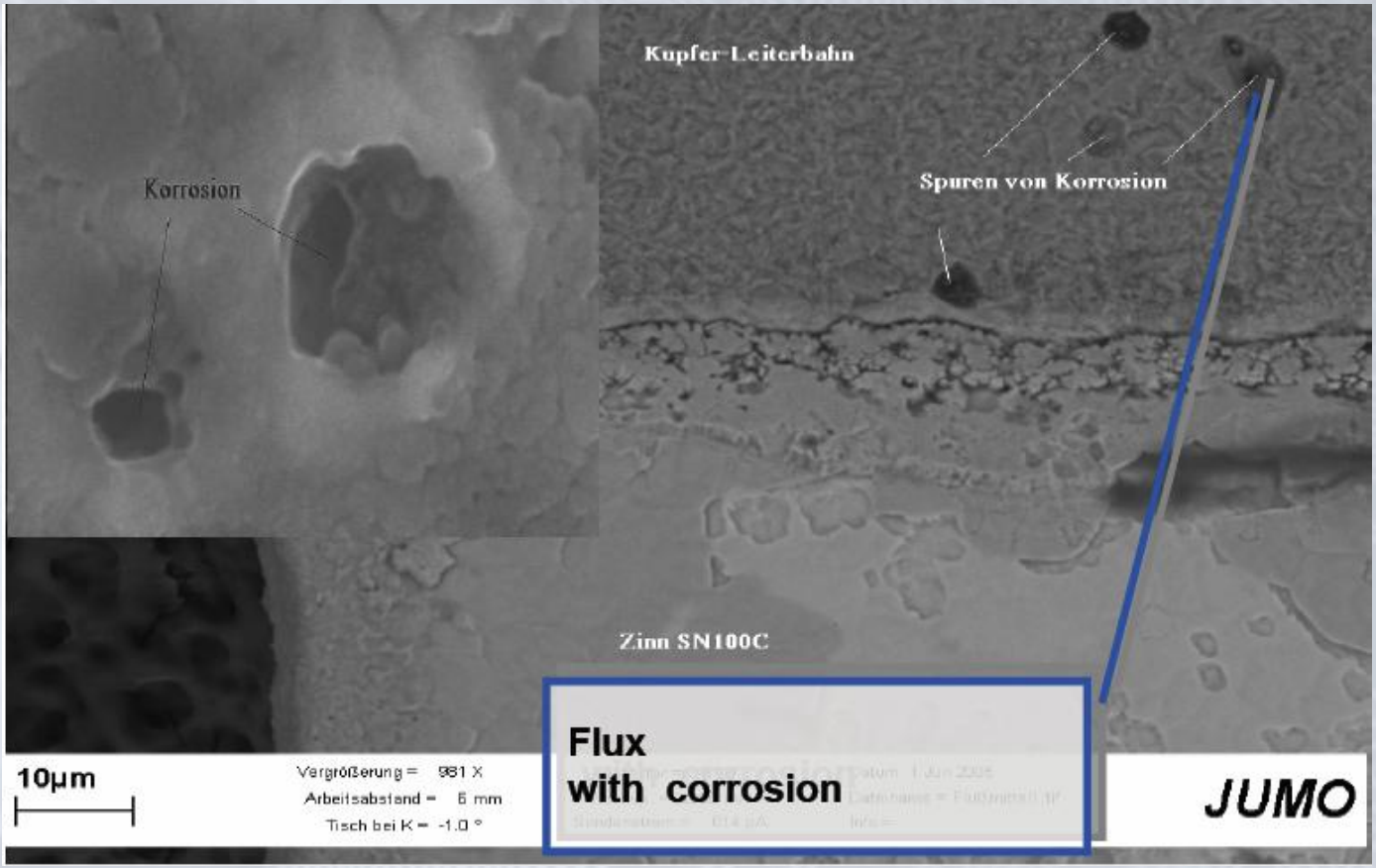
classification for global system's supplier

Test conditions:

- 2.000 cycles 0°C to 150°C
- 1 cycle is completed in 1 hour
- 5 VDC

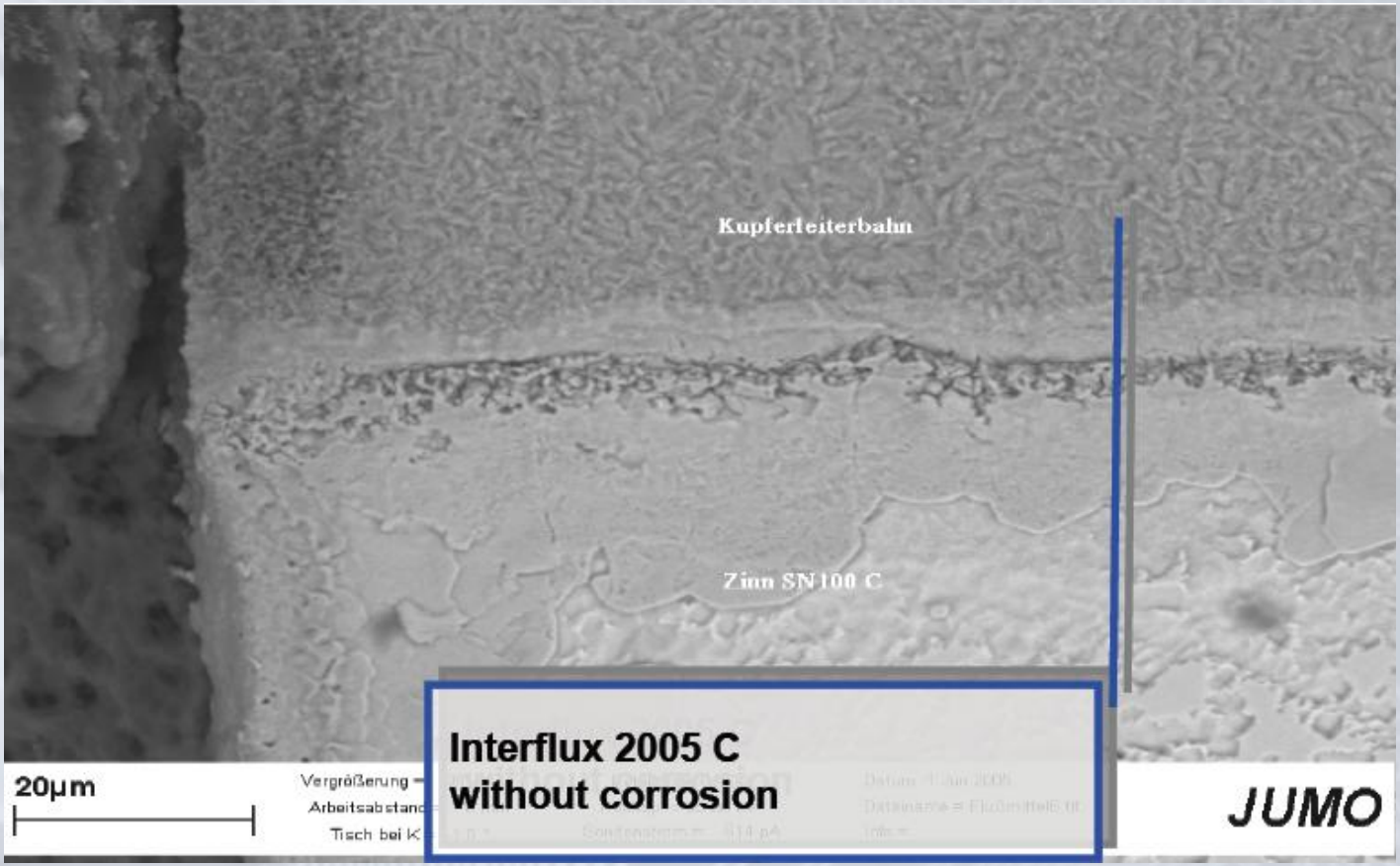
Flux **corrosion** test

Results for a flux used in leaded processes showed to be corrosive in a lead-free process



Flux **corrosion** test

IF 2005C absolute halide free flux has solved the problem



Pb free – Testresult - Corrosiontest Selective - Soldering with SN CU NI

Picture	Flux	Manufacturer	Corrosion
1	Flux 1	Balver Zinn	Yes
2	Flux 2	Alpha metals	Yes
3	Flux 3	Alpha metals	Yes
4	Flux 4	Alpha metals	Yes
5	Flux 5	Kester	Yes
6	IF 2005 C	Interflux	no
7	Flux 7	Solder Chemistry	No, conditional
8	Flux 8	Emil Otto	Yes
9	Flux 9	Solder Chemistry	Yes
10	Flux 10	Balver Zinn	Yes

Flux **corrosion** & **migration** test

modified test conditions J-STD-004 and EN 61109-1-1

Test conditions:

- 85°C and 20% R.H. for 1 hour then 85% R.H.
- surface resistance measurement cycle 60 seconds
- 5 VDC continuous

Flux **corrosion** & **migration** test

modified test conditions J-STD-004 and EN 61109-1-1

Example **FAILED** flux

S.I.R. Value drops directly at start. Starts to pick up after 8 hours but stays too low

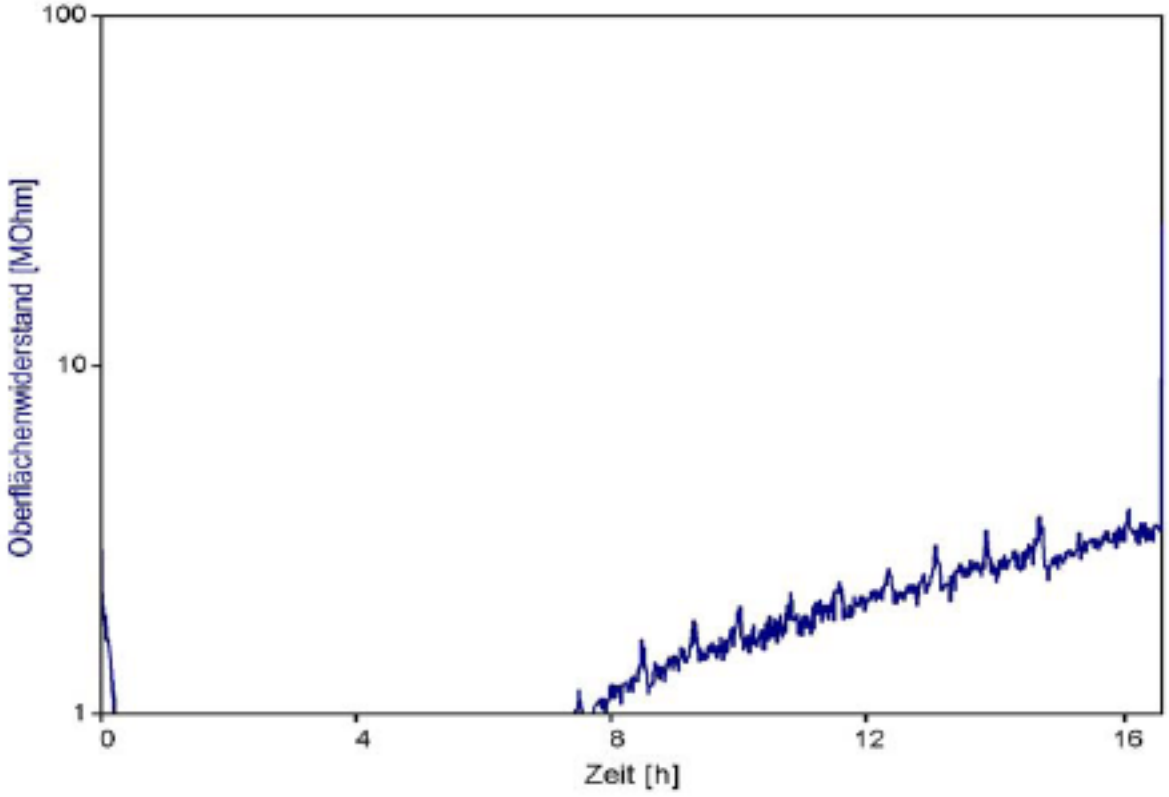


Bild 4: sehr schlechter Oberflächenwiderstand Flux C

Flux **corrosion** & **migration** test

modified test conditions J-STD-004 and EN 61109-1-1

Example **FAILED** flux

Clear case of migration

possible corrosion

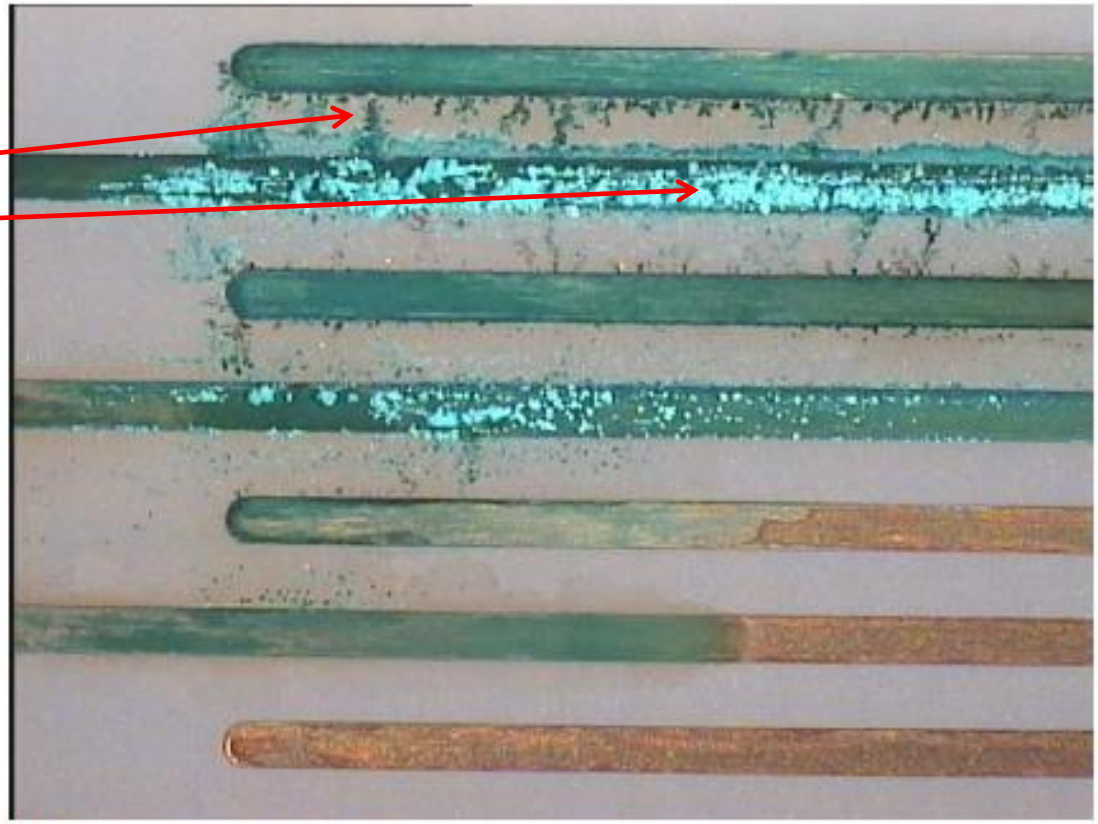


Bild 10: Flux C nach Test

Flux **corrosion** & **migration** test

modified test conditions J-STD-004 and EN 61109-1-1

Example **PASSED** flux

IF 2005 C

No migration
No corrosion

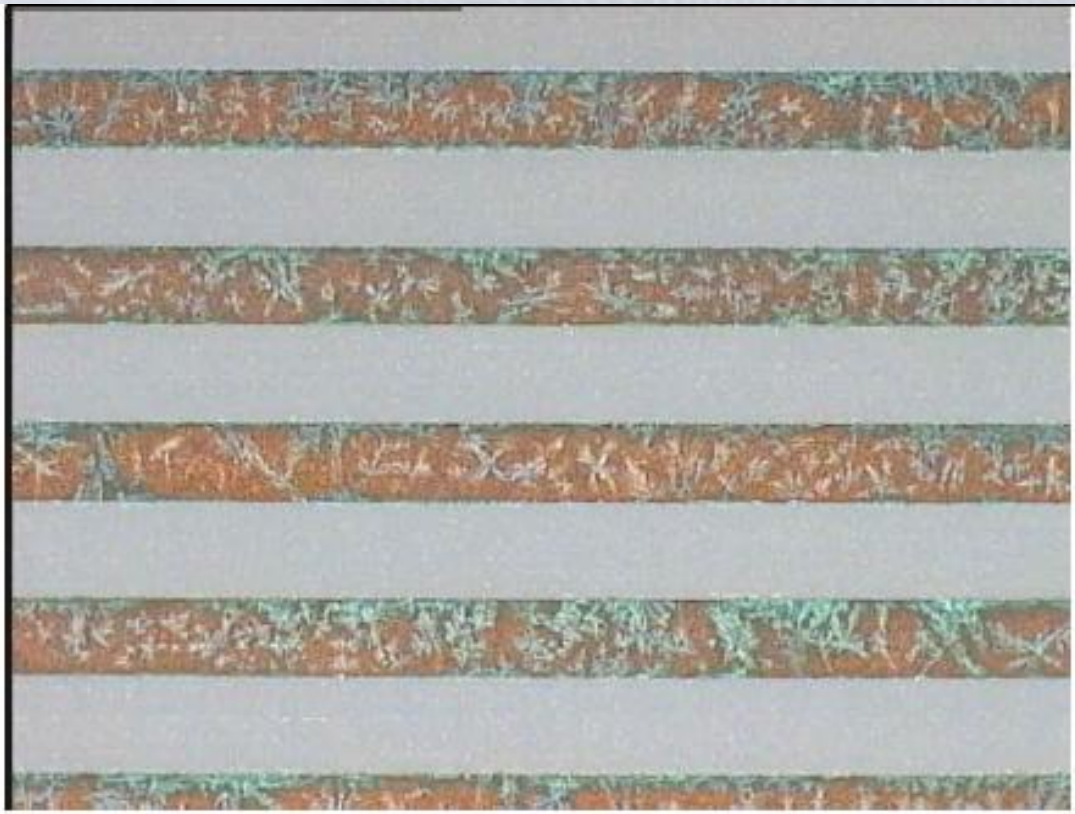


Bild 11: Interflux IF 2005C (Versuch aus Bild 6) keine Migration nachweisbar

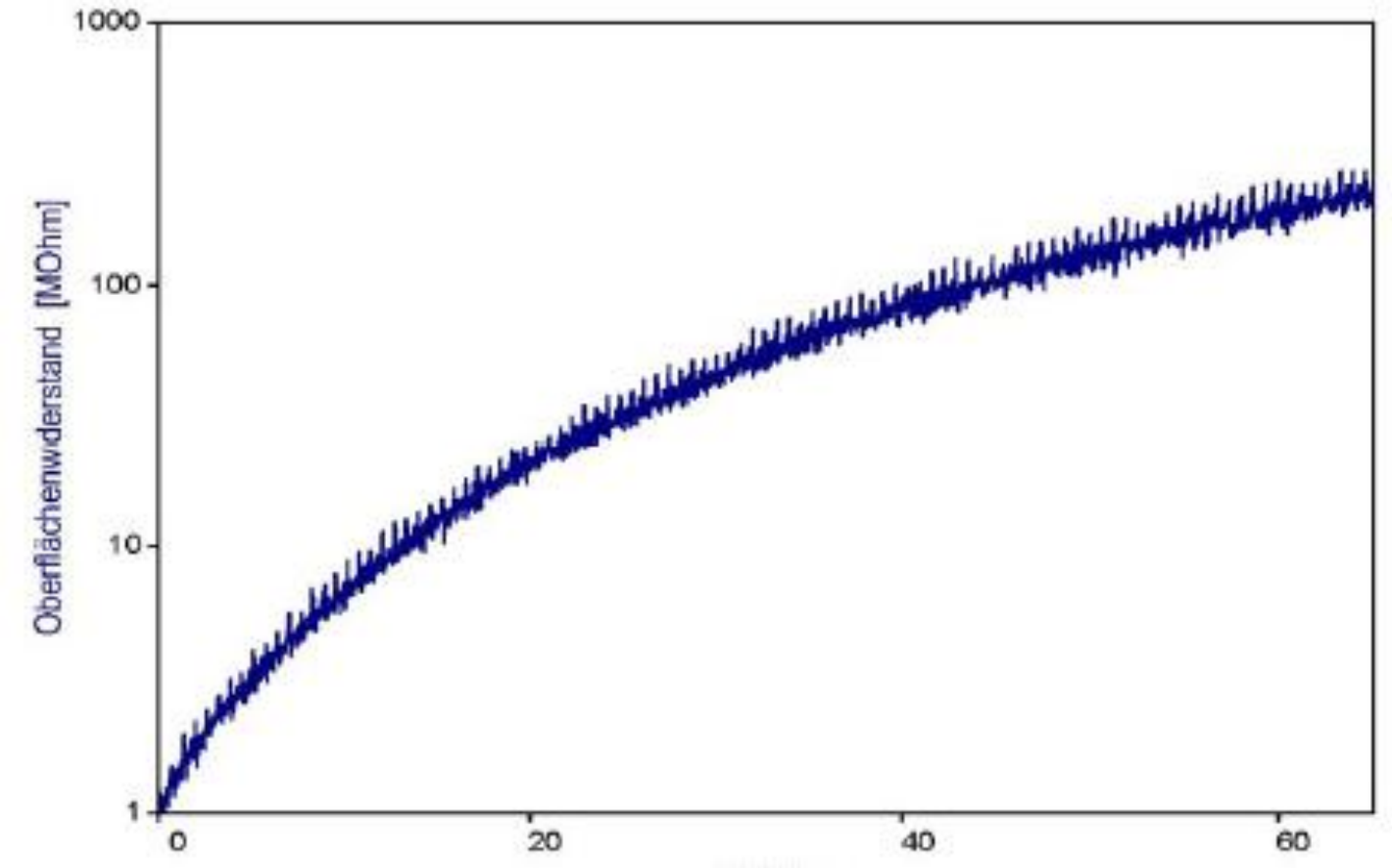
Flux **corrosion** & **migration** test

modified test conditions J-STD-004 and EN 61109-1-1

Example **PASSED** flux

IF 2005 C

Good S.I.R. value curve



Flux IF 2005M uncleaned with and without conformal coating

Test procedure **THALES** TRT

Test conditions:

- 85°C and 85% R.H. for S.I.R. 1000 hours
- - 55°C to + 125°C duration 1000 cycles test VRT (Rapid Temperature Variation)
- 50VDC
- uncoated and coated boards
- coating: Humiseal 1B73 (acrylic) thickness 25-40µ

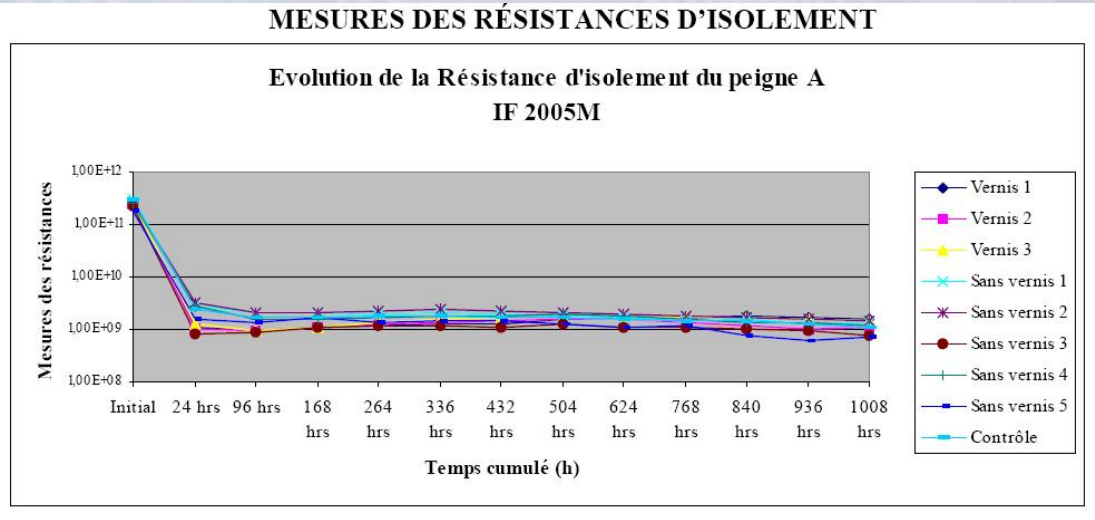
Flux IF 2005M un cleaned with and without conformal coating

Test procedure **THALES** TRT

Ionic contamination of:

- Naked board (before soldering) 0,005 µg/cm2 NaCl
- Soldered board 0,312 µg/cm² NaCl (limit =0,8 – MIL limit=1,30)

Coating adhesion test before and after tests: passed



Conclusion:

- **No-residue** technology fluxes are safe.
- Residue has high compatibility with conformal coating, no reliability issues
- Can be cleaned or left un cleaned and conformal coated

Future?

Solder paste residue is still a problem to be used un cleaned with conformal coating.

INTERFLUX® is working on a No-clean solder paste with same conformal coating compatibility as No-residue fluxes and solder wires.