HTV-Conservation –
The Specialist in Analytics

HTV

Your product is ours

HTV-Conservation – The Specialist in Analytics

Analysis of electronic components becomes more and more important for component manufacturing and component processing as well. Corresponding tests are essential in case of quality problems (detection of failure mechanisms) and production defects for instance or are applied for the determination of the component condition in order to localize failure causes respectively to evaluate failure potentials. On the basis of examination results of the HTV-Analytics Laboratory and its detailed documentation a causal clarification for the application is really fast available.

Detailed examination results

Above all, forced by lack of availability, it is more and more common practice to deal with products of uncertain origin. Hence, it is absolutely important to conduct analytics to protect the quality of the final product. Detailed examinations via X-ray technology, scanning electron microscopy or sample preparations and microsections give information about the present condition of the purchased goods. Extensive inspection reports provide a comprehensive impression, simplify decisions regarding subsequent processing of the goods and present a complete documentation.

Innovation

A modern, quick and high-quality examination of components requires comprehensive state-of-the-art laboratory equipment. Consequently, we are forced to permanently make considerable investments in order to have the most modern and most innovative analytics equipment available. HTV-Conservation meets the high requirements of the practice standards regarding most precise and most significant results and evaluations.

Measuring and reviving solderability

HTV-Conservation offers **revivec**®-Reconditioning Method reliably removing pin coatings. This method is specially-tailored for the particular status of component pins being unsolderable based on oxide coatings or corrosive processes. Hence, a solderability process for your valuable, possibly not anymore purchasable components can be performed again! Moreover, in combination with this, we offer a broad range of most precise, reproducible solderability tests and consequently, a comprehensive analysis and solution for your various solderability problems.

Consulting

At all times a team of high qualified specialists is available for further inquiries and facilitates the evaluation of the extensive examination results. Personal contact and a customer-orientated and practice-orientated expert advice are a matter of course for us.

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Light Microscopy

For the documentation of component damages and for the analysis and examination of solder joints or alternatively microsections the light microscopy is an essential and important analysis method. Depending on the presentation of a problem a variety of microscopes with different magnifications and filters is available in order to obtain an optimal examination result.

Images are digitalized by use of high-resolution cameras and, when required, provided to the customer only in this form or in a complete examination report. For the subsequent analysis of the camera images special image processing tools are available for the better marking of problem zones.

Possible applications:

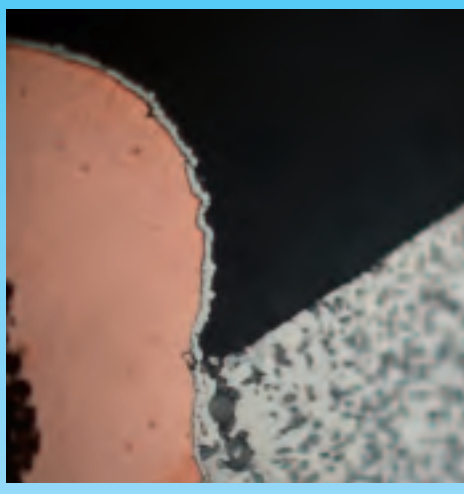
- Surface examination of electronic component pins
- Inspection regarding occurrence of oxidation and diffusion
- Determination of layer thicknesses
- Documentation of deformations / damages / cracks
- Analysis of printed circuit boards, solder joint examinations

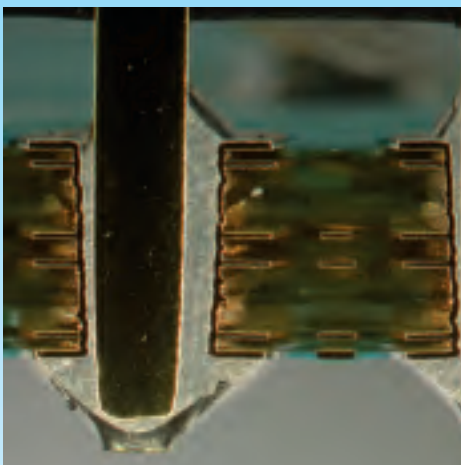
Microsections

As soon as failures in components or printed circuit boards cannot be detected via visual light microscopy or to also analyse and document aging processes the preparation of microsections is a necessary and meaningful alternative option in many cases. Along a defined line a highly precise cut through the specimen is generated and embedded into special resin afterwards. Based on subsequent measures of grinding and polishing with sample-specific formula, to be performed with the utmost care, a surface meeting highest demands is originated. Special soft etching technologies prepare the test specimen for the subsequent examination via light microscope or scanning electron microscope. Hence, failures and problem areas of components or printed circuit boards are visible and tangible.

Possible applications:

- Determination of failure mechanisms of electronic components
- Detection of layer thicknesses at component pins
- Analysis of solderings, plated through holes, bond areas
- Identification of cracks and other damages, e.g. based on the soldering process or mechanical stress
- Detection of delamination in printed circuit boards

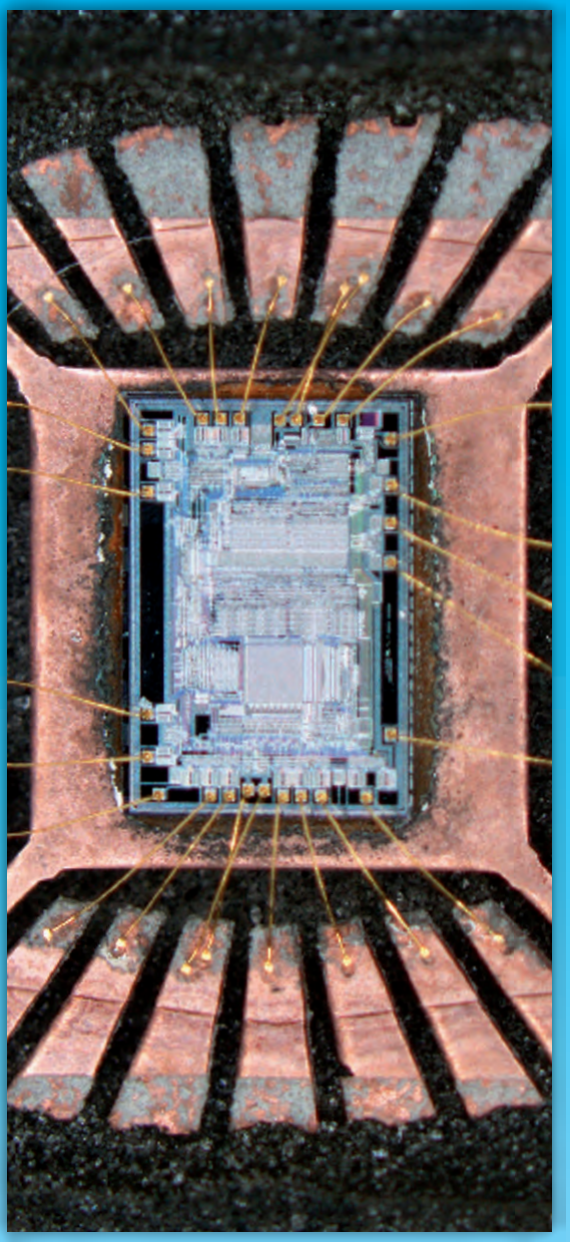




Component Opening

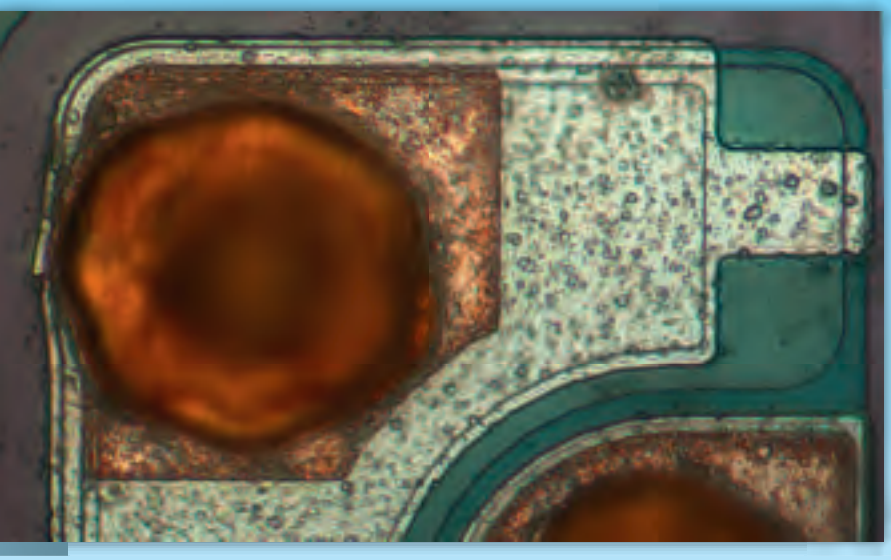
In cases where a direct examination of chip surfaces is necessary, e.g. to detect the exact version of the used chip or its manufacturer, an opening of the electronic component can be important. The opening process is very complex and requires a special know-how, grown at our facilities over years. The procedures must be tailored exactly to the component material to avoid unwanted internal damages.

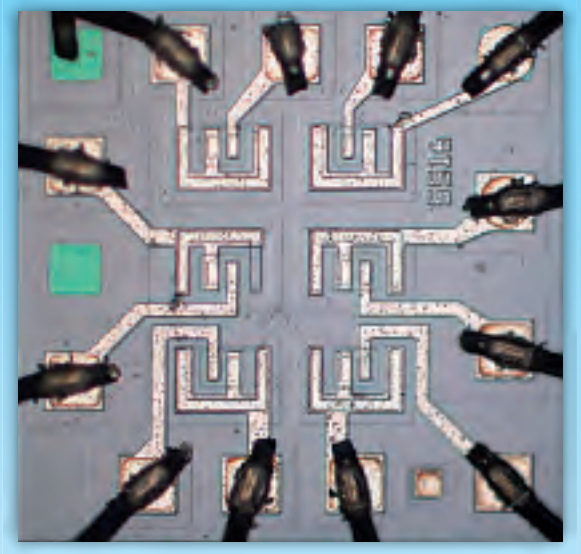
With subsequent examinations per light microscopy or scanning electron microscopy we generate an insightful analysis of causes resulting from potential ESD overloads of the component, excessive currents, mechanical stress or similar effects.

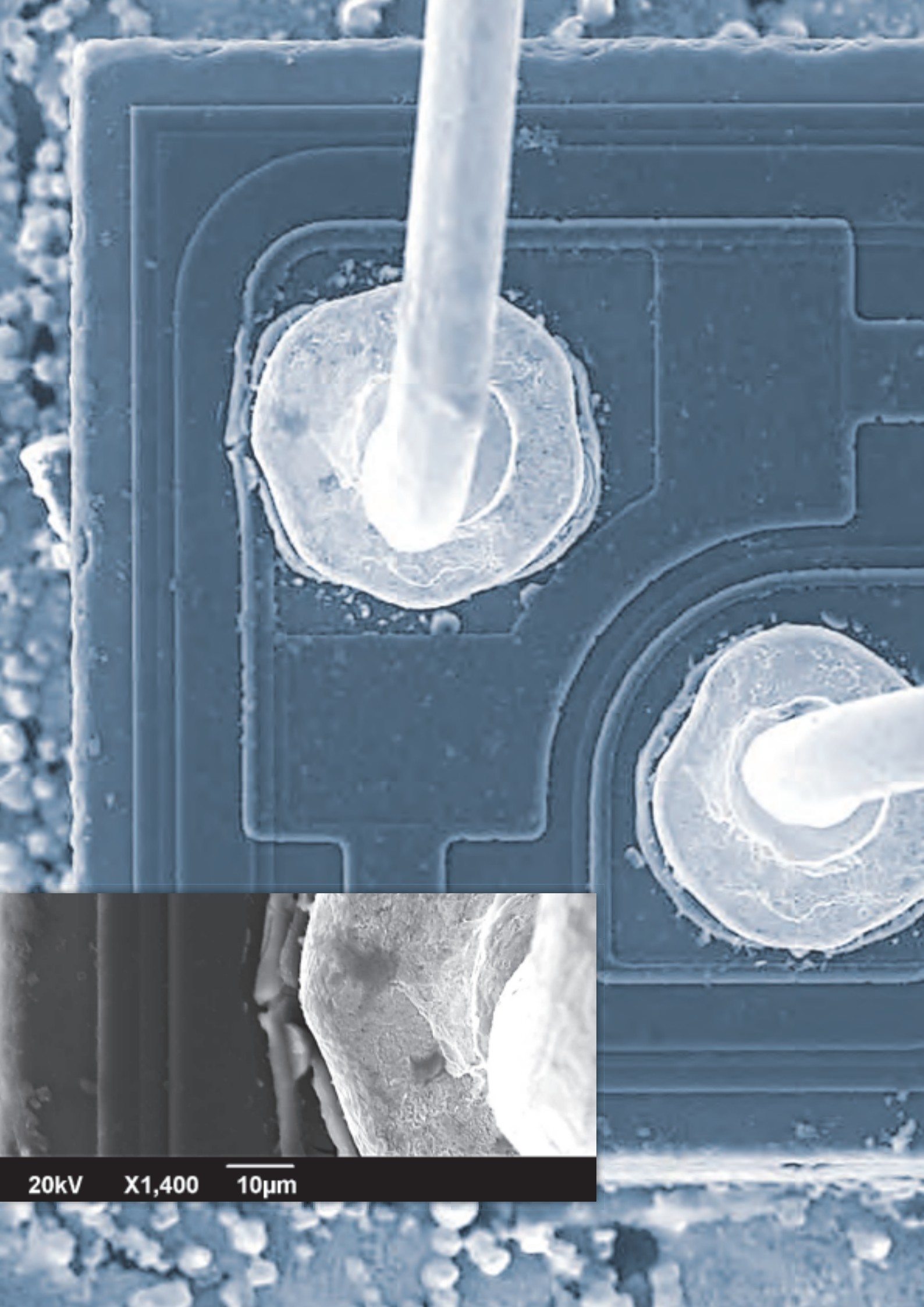


Possible applications:

- Detection of overloads
- Determination of manufacturer (authenticity)
- Examination of bond areas, micro-cracks, structure failures






20kV X1,400 10µm

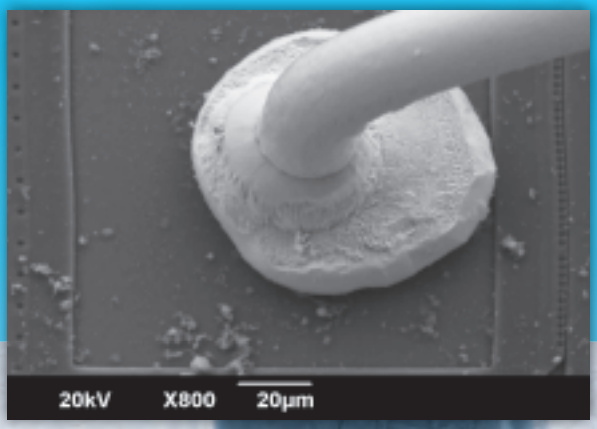
Scanning Electron Microscopy

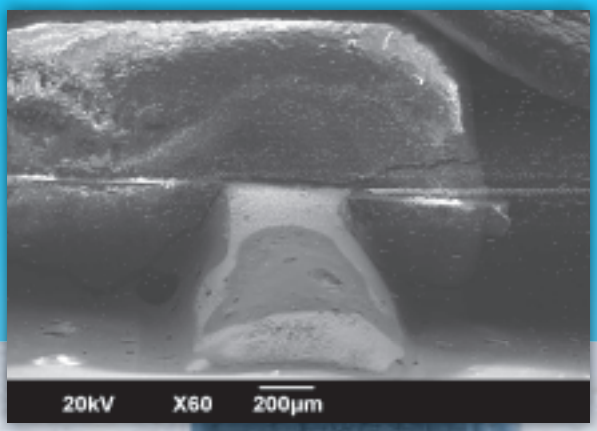
Based on migration and evermore complex, superfine component structures the scanning electron microscope is more and more important within the scope of quality analysis of components. Even most critical samples can be clearly analysed and documented regarding aging processes and weak points via most enlarged pictures in superior quality and image definition. Hence, component failures or processing faults will not only be detected, but, in connection with a detailed examination report, the client also receives a valuable support to conduct negotiations with suppliers.

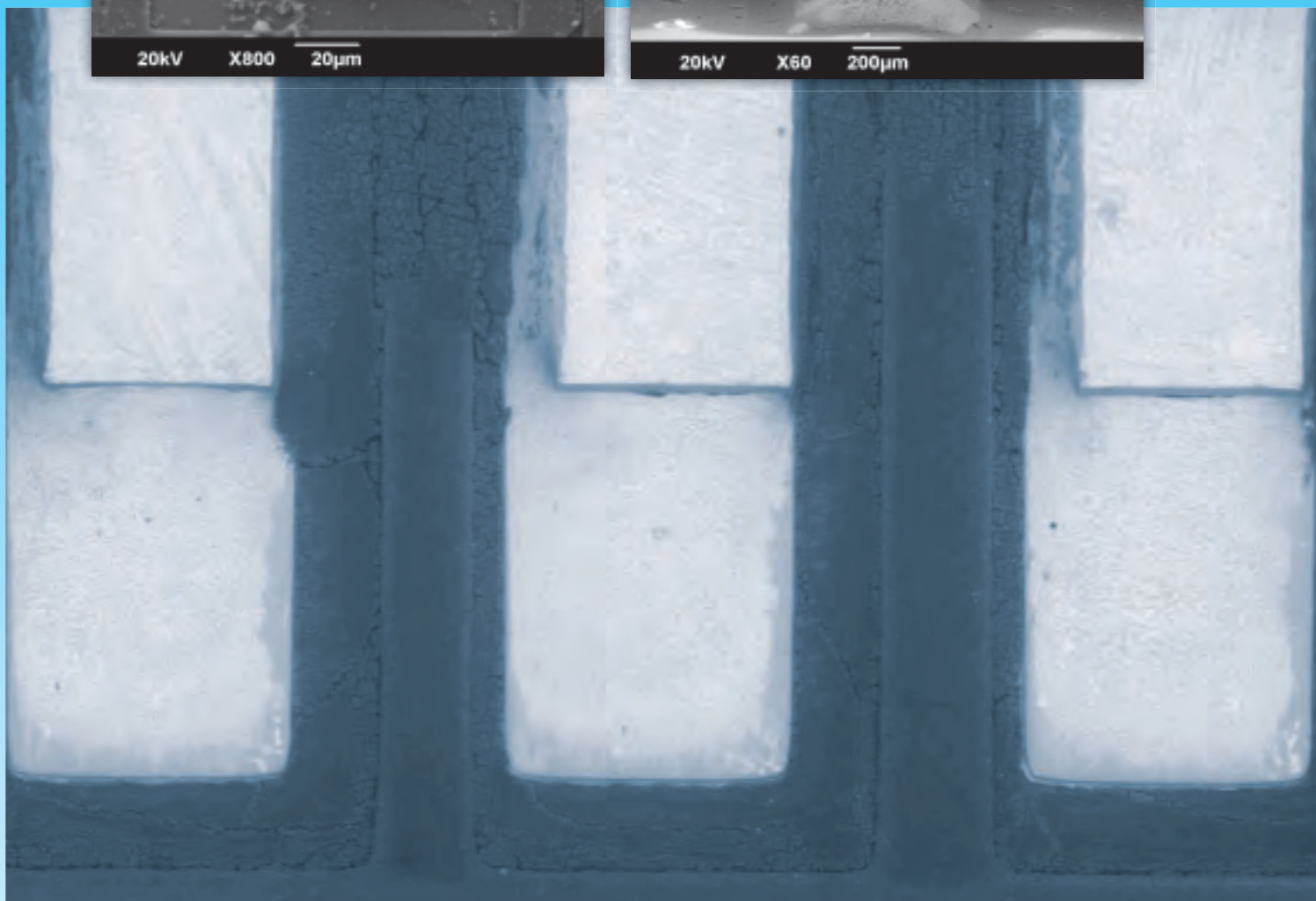
If light microscopy reaches its limits a new world can be discovered with the scanning electron microscopy!

Possible applications:

- Surface inspection of electronic components
- Determination of the layer composition of component pins
- Analysis of poorly conducting samples and surfaces in low vacuum operation
- Detection of micro-cracks



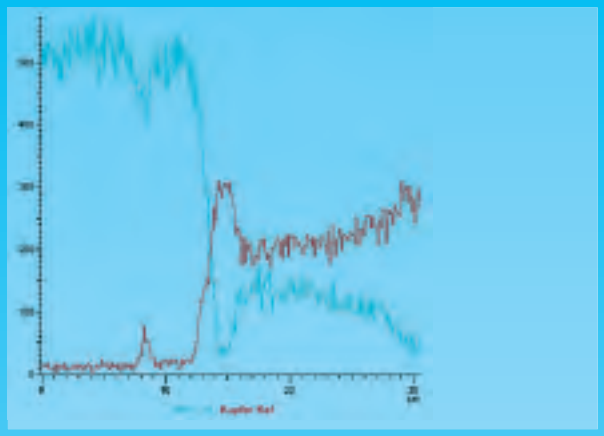


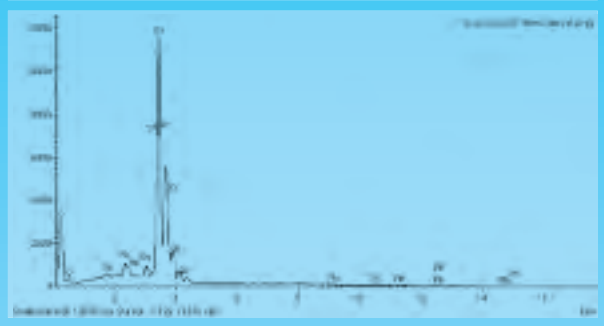


Energy Dispersive X-ray Analysis (EDX)

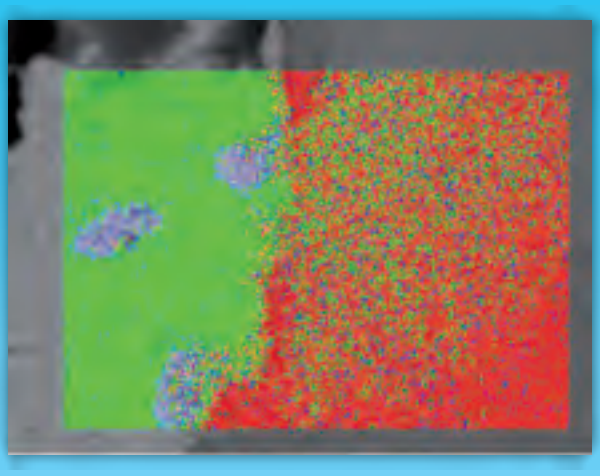
Possible applications:

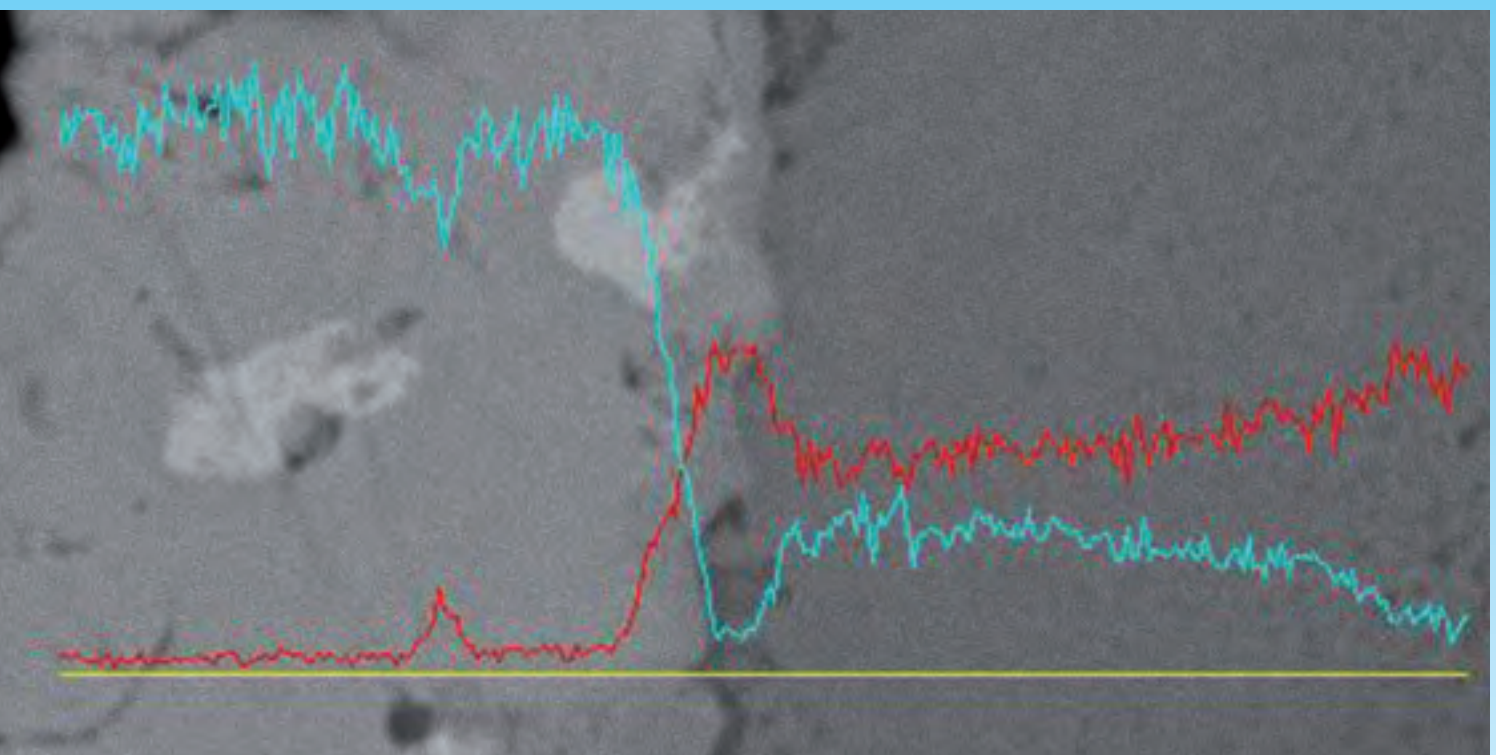
- Determination of the elementary composition of samples
- Analysis of the diffusion progress at the transition point of different materials, i.e. measurement of intermetallic phases
- Detection of the curve behaviour of intermetallic phases
- Homogeneity of materials





For questions regarding the specific composition, the structure of layers and the metallizations the EDX system in combination with the scanning electron microscope provides a detailed statement about the containing elements, their localization in the sample as well as the age of the components respectively their suitability for storage. Consequently, the concentrations of metals can be determined qualitatively and quantitatively along a freely defined line of a microsection and can be recorded in charts. The result is an accurate statement of how the materials are already diffused into each other and, where appropriate, a further storage or processibility is still safe respectively if improper materials, such as for instance lead, are present.



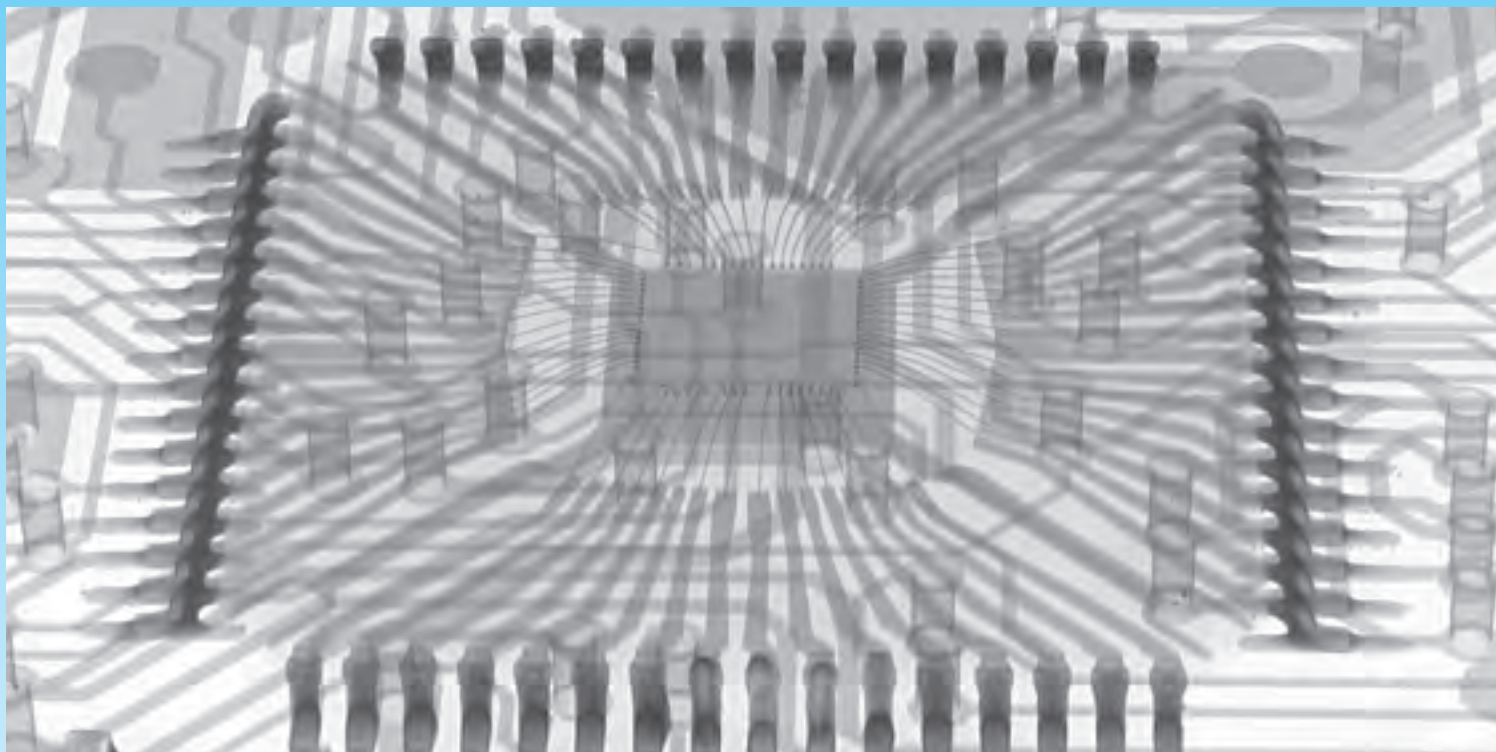


X-ray Inspection

The necessity of a non-destructive examination of components or assemblies oftentimes requires an inspection via X-ray technology. In the process lead-frames, bond wires and chip positions of the component, for instance, can be analysed. In the case of printed circuit boards an examination of the inner conductive path layers is possible. Soldered BGA components can be examined regarding the correct homogeneous solder joints. In case of components whose origin is doubtful an X-ray inspection can show if a chip is generally integrated into the component, if there is no deviation in the bond sequence or bond wire junctions can be recognized.

Possible applications:

- Non-destructive examination of bond areas and lead-frames
- Inspection of hidden solder joints (e.g. on BGAs)
- Formation of cracks in pins or solder joints



Fourier Transform Infrared (FTIR) Spectroscopy

Within the scope of comprehensive cooperation with technical colleges and universities we developed an economical procedure for the analysis and evaluation of organic materials and substances in connection with our services for long-term conservation of electronic components. On the basis of outgassing and degradation processes occurring during conservation and storage it was our goal to cyclically evaluate the organic substances of components regarding the aging resistance and changes during storage and conservation processes. Corresponding examples are mold material of electronic components, plastic foil (DryPack foil) and mainly the synthetics of component containers (trays, tapes).

Result is a Fourier Transform Infrared Spectroscopy (FTIR-Spectroscopy) with a unique database system developed by ourselves, enabling the generation of a qualitative statement and comparability with respect to the used materials within shortest time. On the basis of material-characteristic peaks and spectra the ingredients of a test specimen can be determined via a comprehensive spectra library. Aging processes or water inclusions can be detected based on intensity alterations of the single peaks. When comparing the spectra in a specified period of one year for instance, an indicator for the progression of aging processes in the material is provided.

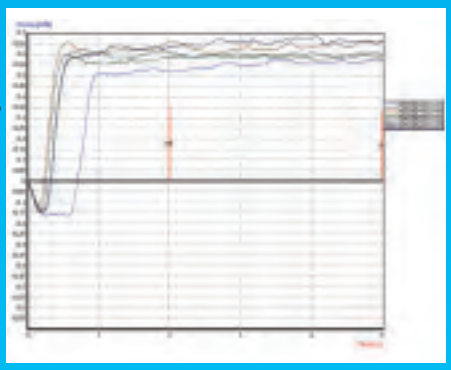
Possible applications:

- Determination of the composition of plastic material such as mold mass of electronic components, tray material and tape & reel substances
- Detection of the water percentage of plastic materials
- Analysis of volatile components and substances
- Determination, evaluation and comparison of the aging status of organic materials

Highly precise, fully automated Solderability Test

Especially in the particular case of obsolete components one is confronted with the problem to determine the solderability objectively and quantitatively. Via a fully automated Solderability Test System the specific wetting forces of each single component pin can be determined and documented. Consequently, the differences regarding the solderability of diverse component batches or various obsolete components can be identified. The results obtained can be stored, and then again and again be compared with the present measuring results. Thus, one receives a history regarding the development of solderability over a specific period respectively an overview of the solderability of different batches.

- Solderability Tests according to diverse International Standards, such as for instance:
  - ANSI / J-STD-002
  - MIL-STD-883C
  - IEC 68-2-54
- Coloured, graphic representation of test results
- Quantitative statement regarding the wetting forces
- Video documentation
- High reproducibility



Possible applications:

- Determination of processibility of components
- Solderability Test of printed circuit boards, SMD pads and plated through holes
- Analysis of solderability problems
- Incoming inspection

Cleaning and Reconditioning of electronic components

The **revivec**®-Reconditioning Method, especially developed at HTV for electronic components, enables the removal of organic and inorganic effects in form of oxide layers, corrosive areas and diverse impurities at component pins. On the basis of material-specific and to the respective oxidation level adjusted compositions the relevant areas are cleaned, evaluated and finally regenerated in an ambitious process. Based on this particular know-how, especially generated in our facilities, the solderability, specifically of older parts, can be revived. The procedure is also appropriate to printed circuit boards, leadframes or mechanical components and is then adjusted to these requirements.

Possible applications:

- Reviving solderability
- Cleaning and reconditioning of oxidized or corroded surfaces
- Removal of inorganic and organic impurities

Detailed Examination Report

All analysis results of components are made available to the client in form of comprehensive examination reports according to customer-specific requirements and in various levels of detail and volume. Depending on the method of examination the reports contain corresponding images and diagrams and provide answers for the client's questions and hints for the further cause of action. Hence, we perform valuable suggestions, evaluations and solutions regarding the client's problems.

HTV-Analytics

- Light Microscopy
- Microsections
- Component Opening
- Scanning Electron Microscopy
- Energy Dispersive X-ray Analysis (EDX)
- X-ray Inspection
- Fourier Transform Infra-red (FTIR) Spectroscopy
- Highly precise, fully automated and reproducible Solderability Tests
- Cleaning and Reconditioning of electronic components according to the HTV-revivec®-Reconditioning Method

Experience our competence!

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NEW at HTV

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New analysis processes and processing methods

- ***3D X-ray***
  Computed tomography for 3-dimensional presentation of hidden details
- ***Ion-Beam Etching***
  Visualization of surface structures in the nano-range
- ***Reverse chip preparation according to HTV - DIE-Layering® Method***
  Failure analysis at die level with highly-precise, selective de-layering of single chip layers
- ***Analysis of components and circuit boards***
  Quality and failure analysis of assembled PCBs or modules
- ***Retinning - HTV - NovaTIN® Method***
  Removing of existing tin layers including intermetallic phases and rebuilding of a stable and solderable pure-tin layer

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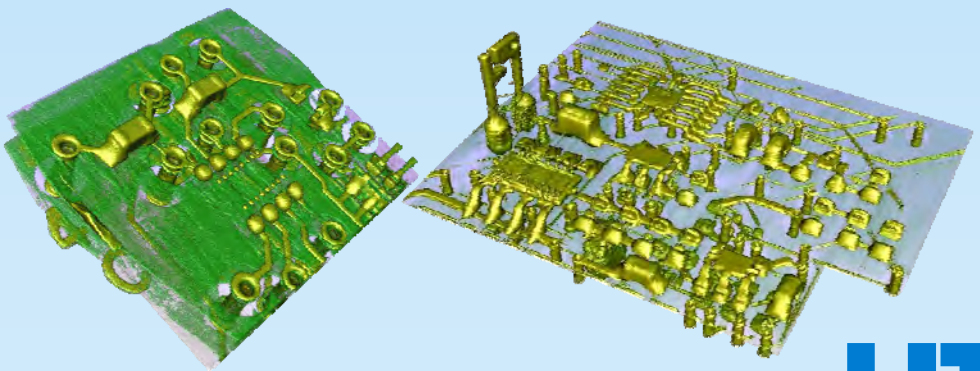
3D X-ray

The computed tomography (CT) offers an option for a non-destructive examination of components as well as for assemblies in view of possibly existing material defects or processing errors. With this three-dimensional presentation, processed from single 2D scans, different materials can be highlighted with colors, accordingly be localized and precisely be analyzed.

Possible applications:

- Inspection of hidden solder joints or inaccessible areas
- Quality check of complex assemblies, devices or PCBs etc.
- Determination of polished surfaces for in-depth analysis



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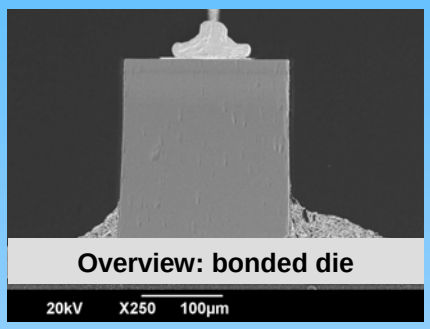
Ion-Beam Etching

Due to the different material hardness it is unavoidable that blurrings result at mechanical specimen preparation with subsequent micro-polishing which make an examination of transition layers and structures in the nanometer range impossible.
With Ion-beam etching the material of a polished specimen is etched at atomic level. The ion-beam, computer controlled with integrated camera monitoring, is directed towards a selected surface section.
Finest blurrings are removed and smallest details become visible again.
Subsequently, these surfaces will be analyzed, e.g. by scanning electron microscopy (SEM) or by EBSD (electron backscatter diffraction), in order to evaluate and document structures and transitions in the nanometer range.



Overview: bonded die

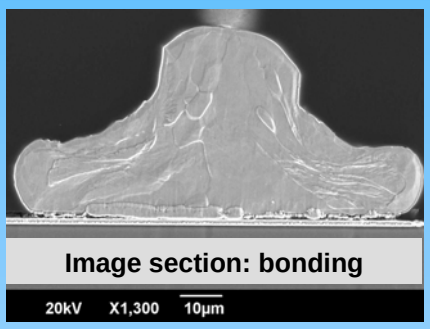
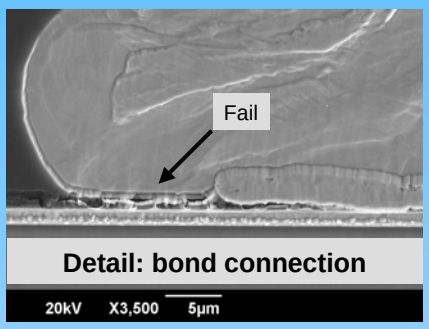


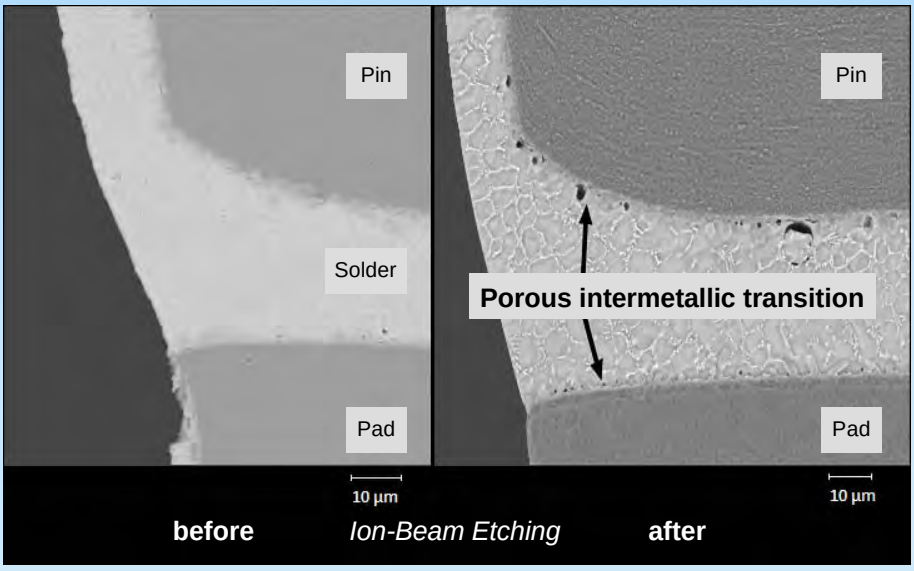
Image section: bonding



Detail: bond connection

Possible applications:

- Visualization of grain boundaries and rolled structures in the nanometer range
- Detection of inclusions, contaminations or, for example, incipient whisker formation
- Higly precise preparation an identification of finest coatings
- Visualized detection of cracks or delaminations in the micro and nano range



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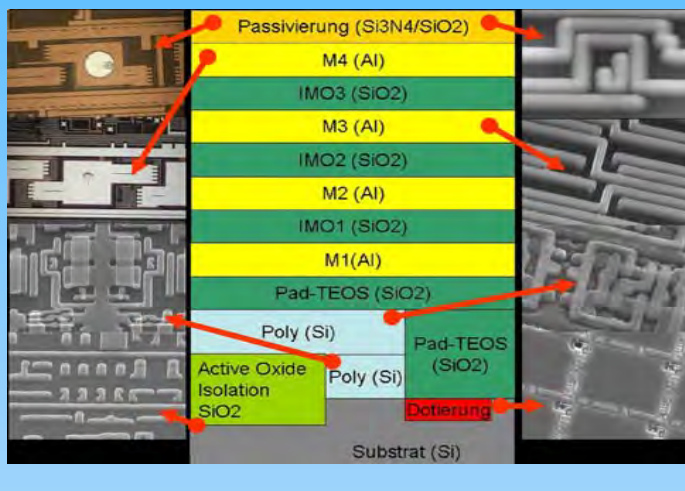
Reverse chip preparation according to HTV - DIE-Layering® Method

For exact process control and diagnostics at die level the analysis of internal chip layers is performed according to the **DIE-Layering®** method, developed by HTV.
Single layers of the die are etched with high precision from passivation to the selected die layer by using specific etching methods in a unique combinatorics. In the next step analysis and evaluation of exposed structures take place with the scanning electron microscope (SEM).
Hence, detailed conclusions are obtained for the process optimization, for example at wafer production, or manufacturing defects are quickly recognized in case of atypical components already assembled.

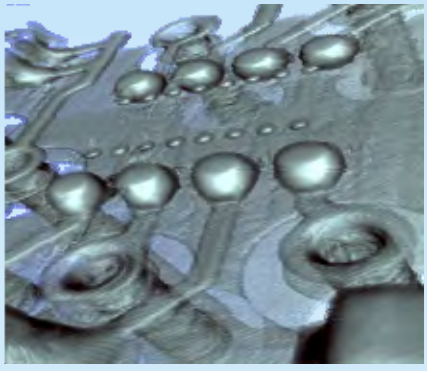
Possible applications:

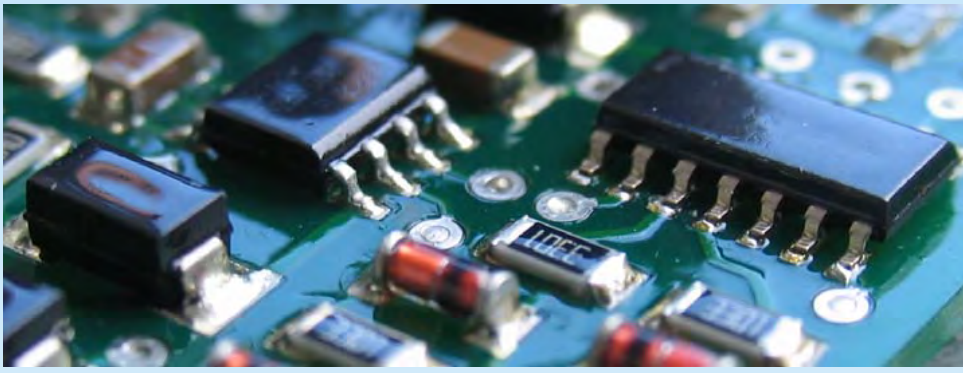
- Assurance of design and process quality
- Monitoring and evaluation of selected die layers
- Gaining basic information for the optimization of the die layout
- Failure analysis at die level



Analysis of components and circuit boards

Evaluation of manufacturing quality of modules is not only important prior to a long-term conservation. Respective examinations for process control are indispensable, both, during production and within the scope of failure analyses!
Due to versatile, ultramodern analysis possibilities failure potential is ascertained at an early stage and appropriate corrections can be implemented as soon as possible. Examinations are individually aligned together with the customer or performed on the basis of common standards (e.g. IPC-A-610).
A detailed examination report together with expressive image documentation describes the current state of modules or assembled PCBs.





Retinning - HTV - NovaTIN® Method

Bad solderability of components has a multitude of action mechanisms. Main causes for it are usually contamination, oxidation or mutual diffusion, e.g. of copper and tin, partly up into the pin surfaces. Thereby, production of reliable solder joints is rather difficult or even impossible.

The unique **NovaTIN®** method, developed by HTV, is based on a complete and very precisely removing of corroded tin layers including intermetallic phases!

Specific process steps result in a stable and solderable, newly created pure-tin layer. This ensures reliable solder joints at automated processing in SMD production lines.

Possible applications:

- Oxidized surfaces of components with older date codes
- Bad solderability of improperly stored components
- Re-alloying of components from leaded to lead-free
- Selectively removing of intermetallic phases
- Retinning of desoldered components

Make a great leap forward

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