

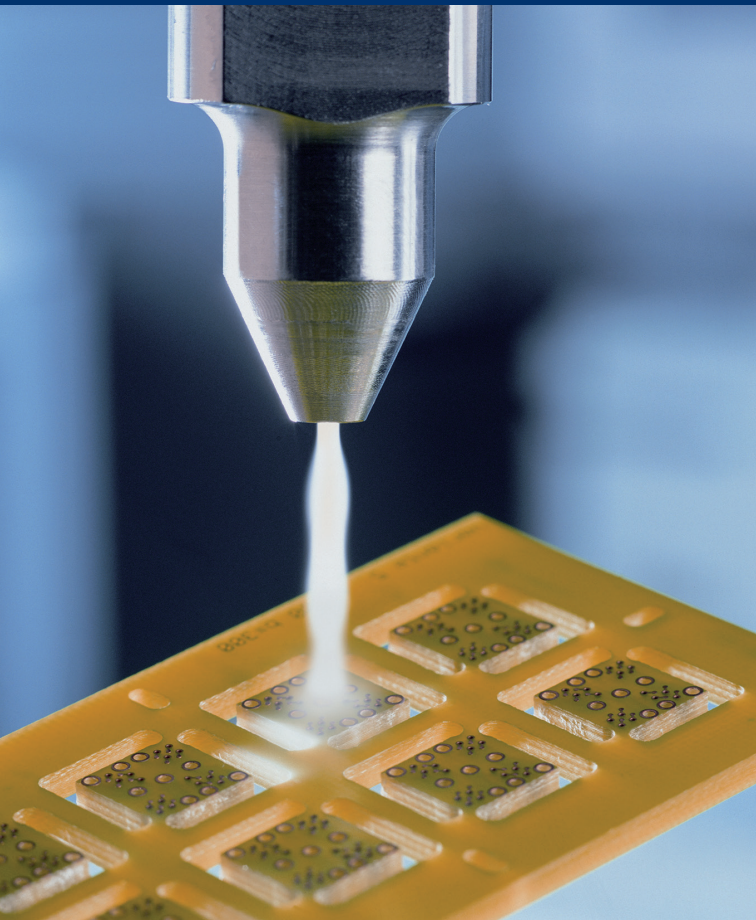


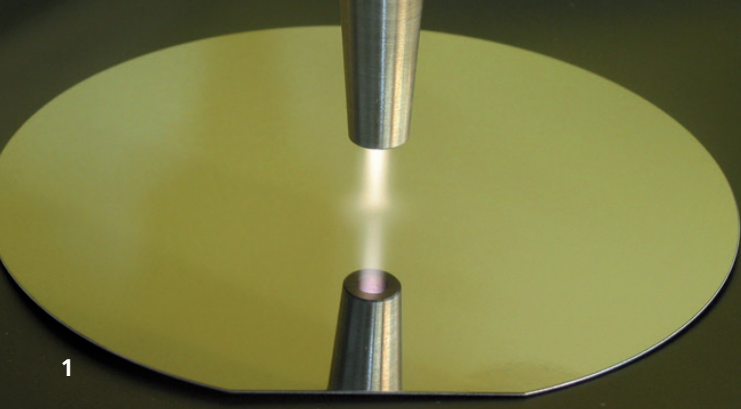
Fraunhofer

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MANUFACTURING ENGINEERING AND AUTOMATION IPA

PRECISION AND HIGH-PRECISION CLEANING PROCESSES






Starting point

The simultaneous increase in miniaturization levels and in the integration density of components and systems in microtechnologies places high demands on cleaning technology as far as the size of particles to be removed, layer residues, localized cleaning, avoidance of damage to neighboring structures and material incompatibilities are concerned.

Even tiny quantities of contamination are enough to cause shorts in microelectronic products. Contamination on optical components leads to poor layer adhesion and losses due to scattered light. Furthermore, mechanical systems can fail if a critically-sized particle blocks power transmission.

Procedure

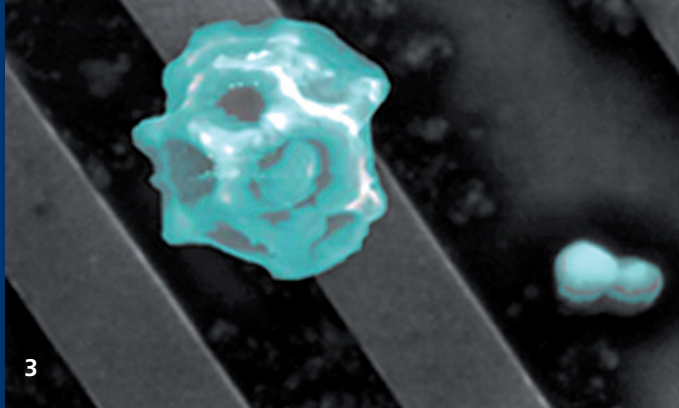
One of the core aims of scientists working at the Department of Ultraclean Technology and Micromanufacturing is to avoid product losses caused by contamination. Based on long-standing experience in manufacturing and cleanliness issues together with an impressive range of analytical measuring equipment, on solving a contamination problem their main focus is generally on finding ways to prevent the contamination from occurring in the first place. Production-adapted testing and cleaning techniques capable of effectively



removing the contamination present are only investigated if an avoidance strategy cannot be found. In combination with methods to maintain cleanliness right up to component processing, the manufacture of high-quality products is guaranteed. In the field of precision and high-precision cleaning at the Department of Ultraclean Technology and Micromanufacturing, mainly localized cleaning techniques are tested, researched and further developed.

CO₂ ice cleaning process

CO₂ ice cleaning is a residue-free blasting process with a wide range of application. Either CO₂ ice pellets or snow is used as a blasting medium. At the point where the CO₂ impacts, the temperature shock makes any existing contamination contract and become brittle, causing it to detach from the surface and be transported away due to the impulse of CO₂ jet and the sublimation of solid-state CO₂. The blasting process can be used to remove filmy and particulate contamination from a broad spectrum of base materials without causing any damage.



Plasma cleaning

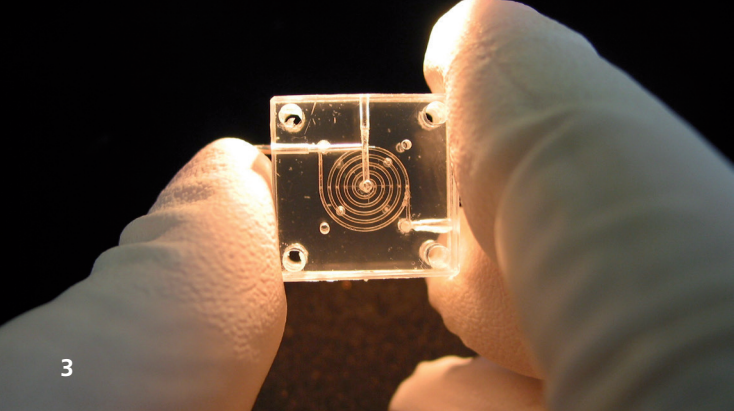
With plasma cleaning, ionized gas and radicals are generated and then directed via a nozzle at the component to be cleaned.

The reaction between the gases and any organic contamination present on the surface enables the latter to be removed in a very gentle manner. The use of reducing gases not only has a cleaning effect but also removes oxide layers from surfaces.

Ultrasound or megasound cleaning

In the case of ultrasound and megasound cleaning, tiny particles are removed from surfaces by the implosion of cavitation bubbles forming in the cleaning liquid. This effect can be enhanced if cleaning media are used.

- 1 *Using plasma to clean a silicon wafer.*
- 2 *Micro-optical lens (contaminated).*
- 3 *Particle on a printed circuit board.*



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Our range of services

- Contamination analysis
- Specifying cleanliness requirements
- Generating specifically contaminated surfaces
- Developing and optimizing cleaning processes
- Designing and realizing cleaning tools
- Developing cleanliness concepts for transport, storage and processing

TITLE *CO₂ snow-jet cleaning with patented supersonic nozzle.*

3 *Micromixer with blockages.*

4 *Microdrive with particle causing a blockage.*

**Fraunhofer Institute for
Manufacturing Engineering and Automation IPA**

Nobelstrasse 12
70569 Stuttgart | Germany

Director

Prof. Dr.-Ing. Thomas Bauernhansl

www.ipa.fraunhofer.de

If you require more information about our range of services or specific advice, please get in touch with our contact partners.

Department

Ultraclean Technology and Micromanufacturing

Contact

Dipl.-Ing. (FH) Ralf Grimme
Phone +49 711 970-1180
ralf.grimme@ipa.fraunhofer.de

Dipl.-Ing. (FH) Christof Zorn
Phone +49 711 970-1506
christof.zorn@ipa.fraunhofer.de

www.ipa.fraunhofer.de/cleanroom