iplas
innovative plasma systems gmbh

CYRANNUS®

desmearing of flexible circuit boards

R&D100 Award 2003

Young Female Entrepreneur Award 2000

„Aus den praktischen Erfahrungen mit den Hidden Champions lernte ich mehr über Management als in zwei Jahrzehnten wissenschaftlicher Forschung“

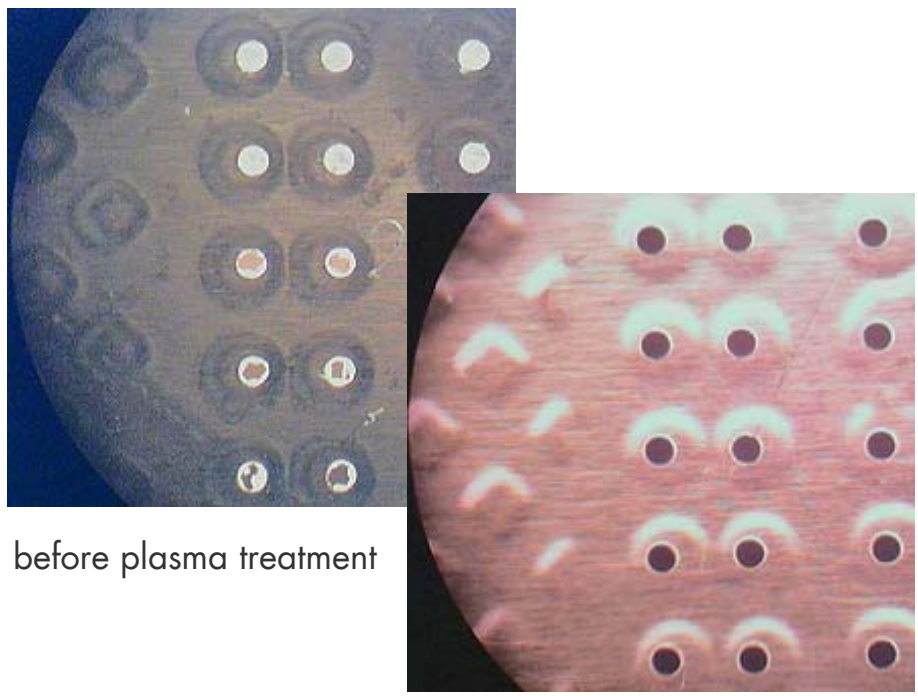
Prof. Simon (founder of Simon, Kucher & Partners)

CYRANNUS®
cylindrical
resonator with
annular **s**lots

int. patents approved or pending, e.g.

EP 97906173
EP 98928283
EP 0872164
US 6204603 B1
US 6198224
US 6543380
JP 531466
JP 524812

fast and reliable process in fully automated or semi-automated plasma systems



before plasma treatment

after plasma tratment

CYRANNUS® technology

Plasma easy to apply!

desmearing of flexible circuit boards with *CYRANNUS®* microwave plasma

drilling

of holes into flexible circuit boards leaves residuals at the wall of each hole which are torn out from the adhesive and the polymer (e.g. Kapton) between the single layers of the circuit boards.

removal

of the residuals is essential to ensure the electrical conductivity between the layers of the circuit board. Chemical and thermal stability of polymer and adhesive make it very difficult to find an effective treatment without board damage.

plasma treatment

is the only successful methode for the desmearing procedure. A homogeneous plasma can remove the residuals from the drilling holes uniformly.

medium pressure

reduces the contamination of the circuit board by re-deposition.
A non-thermal microwave plasma in medium pressure is the ideal balance between high quality treatment (good removal, no material damage) and fast plasma conditioning (approx. 10-20 sec.)

ensures fast treatment and relatively high process pressure enables in-line / on-line (or sequent) desmearing treatment of flexible circuit boards instead of large batch treatment. Depending on the design of the process flow circuit boards can be fed to the plasma process piece by piece with conveyor, robot, manually or in cassettes.

medium pressure microwave plasma and gas flow for effective desmearing

The increase of pressure is a general approach to faster and more reliable plasma processes. This is enabled by a larger amount of radicals. Furthermore the medium pressure lowers the system requirements.

gas flow

- short mean path length: With shorter paths between collisions of gas particles the gas phase interaction becomes more intensive (Knudsen number). Thus energy loss at the chamber walls is reduced. The large amount of collisions leads to a statistically distribution of radicals into all directions, which finally allows also a certain treatment of small corners, holes and the back side of the material.
- flow condition: Running a gas process with a controlled gas flow allows high gas transfer with fast processes and simplified equipment set-up.
- micro turbulences: Small turbulences appear in a gas flow when the speed is high enough (Reynold's number). They are responsible for the increased efficiency of surface processes.

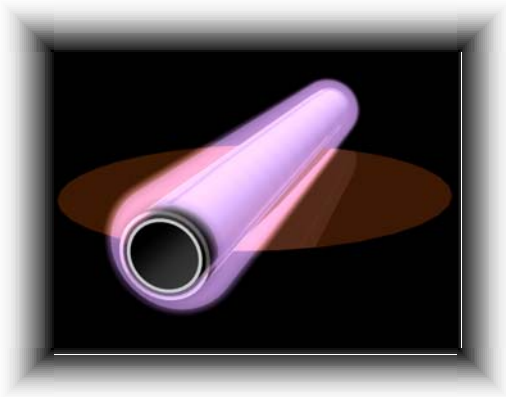
chemistry

- oxygen: removal of organic dirt, degrease
- fluorinate hydrocarbons: supply of halogen with a precursor gas that is easy to handle
- hydrogen: removal of oxide films from copper
- inert gas: buffer gas

principle of *CYRANNUS®* Plasma Sources

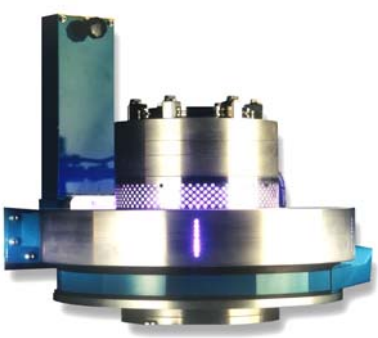
principle

- multi antenna configuration
- high density plasma
- enhanced gas feeding



CYRANNUS® II
plasma source

technology



CYRANNUS® I-6″
plasma source

- operation from vacuum to atmosphere
- homogeneous, stationary plasma
- high gas flow possible
- arbitrary process gas
- electrode free plasma excitation
- reliable operation

performance of *CYRANNUS®*

scalability

- *CYRANNUS® II* plasma sources (linear plasma) can be scaled in length and diameter. That feature is enabled by a patented energy coupling concept.
- *CYRANNUS® I* plasma sources (bulk plasma) can be scaled in diameter or volume.
- By switching the microwave frequency all dimensions of the plasma sources can be scaled.

uniformity

- The uniformity of the plasma treatment with a *CYRANNUS® II* plasma source is very good due to the multi-antenna configuration.
- At higher pressure a ripple appears. The influence on the desmearing process is minor.

gas flow/feeding

- The design of the plasma source enables enhanced gas feeding systems in the afterglow which are required for higher gas flow rates. Thus the process gas requires only a short distance to the flexible circuit board's surface.

easy access

- The system has a simple set up and allows an easy handling/feeding of the flexible circuit boards to the plasma area. The low vacuum requirements enable even single step processes with very fast cycle time.

process start

- The resonator configuration of all *CYRANNUS®* plasma sources lead to reliable starting and operating conditions. Thus control technology can be simplified.

process stability

- The system performs with a remarkable reliability. Compared to conventional plasma technology basing on single resonators, the ability to handle higher pressure, higher gas flow is 1 - 2 magnitudes of order higher.

maintenance

- Most maintenance work can be done easily by trained users.
- Spare parts where designed to gain shortest exchange time and lowest material costs.

CYRANNUS® plasma systems are available in different grades of automation

The desmearing systems are based on an innovative control concept which includes state of the art plasma technology and can be up-graded to latest developments in PLC and field bus technology.

manual

The design of all systems bases on a composition of small modules which control independently physical plasma parameters.

automatic

Customers participate from the innovative system concept with short production time with the possibility of individual adds on. The flexibility is nearly unlimited and no more comparable with conventional control racks as known since long time.

semi-automatic

The systems allow later up-grade of the equipment or addition of further technical features or analytic devices; depending on production development or new technical quality requirements .

CYRANNUS® systems are offered as different types to meet user's needs at it's best.

production

Reliable and powerful production tools with fully automated process control, enable operation with lowest labour costs.

support

Customers who do not want to run own R&D facilities but look for individual processes can use iplas' facility and know-how.

R&D

Manually operated or automated diamond deposition system with maximum in flexibility for research and development without limitations.

only few components are required for a powerful *CYRANNUS®* system

plasma source

- *CYRANNUS® II* plasma source with width of 400mm - 1200mm
- *CYRANNUS® I* - 6″ plasma source (2.7″ or 10.5″ source also available at 2.45GHz) other size or frequency (915MHz) on request

microwave

- 2,45 GHz with up to 6kW continuous wave or 915MHz
- switch mode power supply

tuner

- automated impedance tuning controlled by PLC with different working modes for easy operation

substrate holder

- passively heated, actively heated substrate holder or cooled substrate holder e.g. for diamond film
- holder can be prepared for bias (for seeding or while deposition)
- substrate loading and positioning inside reactor

vacuum

- chamber directly connected to plasma source
- substrate loading and positioning inside reactor

process gas

- individual gas flow controller
- pressure control
- effective gas shower between plasma source and top of substrate

automation

- control system built of modular devices
- PLC Simatic* S7
- field bus Profibus*
- process parameters displayed
- input or change of process parameters on screen
- process documentation module (optional)

safety

- multiple secured safety circuits
- interlocks by hardware and PLC
- system stop depending on failure diagnosis (soft landing / hard landing)
- CE conformity

* trademark by Siemens AG
(other PLC or field bus on request)

It would give us a great pleasure to answer any further questions about the innovative plasma technology and it's application for the desmearing process. Arrangements of visits at the R&D lab in Germany are possible.

For further questions please contact:

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