Welcome at CCR Technology

When we founded CCR Technology in the year 1995 and started to develop RF - Plasma Technology we never thought that we would be facing the beginning of such a success story. We just followed up some technical ideas and wanted to add our modest contribution to the industrial plasma community, but today we know that we added a major contribution, probably the most efficient, flexible and reliable currently existing plasma technology in the market. More than 1500 units in more than 40 countries in the world have been sold in major markets like solar, precision optics, storage media, semi-conductor or hard and decorative coatings. But not the COPRA Technology alone caused this success. It only worked together with our company philosophy. We believe in the ethics as a gap in the market and treating our customers as partners with open access to our knowhow pool, motivated by the fact that only customer’s success is our success prove us right. That is the way we think to operate successfully in innovative markets where rapid success is demanded in order to gain the financial ressources to create front end technology. We are now working in the field of plasma since 25 years and see our jobs as a gift when we are talking to our customers and help setting the course for the development of future technology.

About CCR’s Business

CCR Technology is the inventor of the COPRA Plasma Technology® and serves the supply chain of end user, original equipment manufacturers and research groups in markets like optics, solar, semiconductor, wear & decorative coatings, large area glass coatings as well as storage and display media. The business of CCR is all around COPRA Plasma Sources based on a unique 13.56 MHz RF plasma excitation method which is superior due to its power efficiency, scalability and its reliability. Target applications are plasma enhanced chemical vapor deposition "PECVD" of silicon, metal oxides and nitrides for barrier & functional layers, for optical filter stacks as for protective and wear & decorative coatings, as well as the assistance of PVD Processes as f.e. Sputter Assist or E-Gun Assist.

The COPRA Plasma Technology®

The COPRA Plasma Technology is based on inductively coupled 13.56 MHz RF plasma excitation and its unique feature is the high degree of plasma excitation efficiency in combination with scalability from R&I to any kind of industrial production scale. The COPRA Technology unrivaled characteristics allows one to work with constant basic plasma parameters. This means that your process result is not negatively affected by scaling in size and speed as long as the right power level is adjusted. The COPRA Technology, a potential candidate to bring existing standards on a new level of industrial plasma production.
COPRA Product Family!

COPRA Round Sources (DN-Series)
- Wafer processing up to 12” substrates
- Plasma Assist in PVD Coaters
- Plasma Activation & Cleaning
- Plasma Assisted ALD

COPRA Linear Sources (LS-Series)
- R2R “Web” Processing
- PVD Assist & PECVD in Batch processing
- PVD/PECVD Hybrid Batch+Inline processing
- PECVD on flexible substrates

COPRA Ring Sources (RS-Series)
- Flat Panel PECVD up to Gen5
- PECVD on Large Substrates
- PVD/PECVD Hybrid Batch+Inline processing
- PECVD on flexible substrates

COPRA Built In Sources (IS-Series)
- PVD Assist in E-Gun/Beam Coaters for precision optics
- DLC deposition in E-Gun/Beam Coaters
- Plasma Activation & Cleaning

COPRA Plasma Systems
- InLine or Batch
- PECVD Coaters/Modules for metaloxide/nitride functional coatings
- R&D Coaters
Technical Basics

Power: 13.56 MHz RF, 0.1 to 15 kW

Matching: “always integrated Remote Matchbox”

Gas Pressure: 1E-4 mbar to 1E-1 mbar

Gas: Almost Any

Substrate Size: up to 1300 mm (Single Source Set-Up)

What makes the COPRA unique...

- “Independent control of Ion Energy and Ion Current Density”
- High Ion Current Density enables single source set up for Evaporation coaters of up to 2m calotte/dome size
- The unique COPRA IS, DN+LS series PVD Plasma Assist Sources allow to operate with Ion Energies causing only densification without creating defects
- Matchbox is always integrated (only RF-Power Supply needed)
Advantages of using the COPRA Plasma Technology®

Technical Benefits

- Integrated Matchbox
- Operation with nearly any gas
- Operation with pure gases
- High efficiency with nearly 90% dissociation
- Wide pressure range 1x10⁻⁴ to 1x10⁻¹ mbar
- No filament, no neutralizer, quasi neutral beam
- Ion Current density control independent from Ion energy
- Operation at sputter pressure range
- Plasma densities up to 10¹² cm⁻³
- Highest RF-power transmission efficiency
- Surface activation within seconds
- Lowest temperature rise on substrate
- Drift-free and compressive stress-free coatings
- Plasma beam source with large flux of activating species
- Enable coatings at lowest process temperature

- **high deposition rates up to 10 nm/sec
- **high throughput

**additional benefits especially for PECVD process

General Benefits

- Industrial proven
- Long term process stability
- Maintenance poor
- Scalable to custom size
- Easy to service
- Low operating costs
- Low maintenance costs
- No down times
- Runs with all established 13,56 MHz RF-Power supplies
- Wide productportfolio of RF-ICP Plasma sources
- Wafer size specific sources
COPRA DN-Plasma Beam Source for Wafer Processing up to 12"

COPRA DN251-GR high dissociated Plasma Beam

COPRA DN401-X-DPR for PECVD & chemical Etching
The Round Sources (DN-Series) enables to process wafer sized substrates. The precise control of Ion Energy at different power levels coupled with high ion current density enable intelligent control of process related energies. The customizable design of these sources facilitate particle poor thermal stable and stress less etching and deposition. The COPRA DN-Series are key components in wafer-sized semiconductor or precision optic productions. The DN-Sources are easily scalable to serve customized dimensional needs.

**COPRA DN-Plasma Beam Source for Wafer Processing up to 12”**

Main Applications:

- Etching \rightarrow (chemical+physical etching, soft etching)
- PVD-Assist (Magnetron Sputter Assist) for precision optics \rightarrow Cleaning, Oxidation, Nitriding
- PECVD \rightarrow SiO, SiN, DLC...

<table>
<thead>
<tr>
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<td>Plasma Opening</td>
<td>Ø 84/122 mm</td>
<td>Ø 152 mm</td>
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<td>1x10⁻⁴ to 1x10⁻⁷ mbar</td>
<td>1x10⁻⁴ to 1x10⁻⁷ mbar</td>
<td>1x10⁻⁴ to 1x10⁻⁷ mbar</td>
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<td>0,6 kW</td>
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<td>Substrate width (static)</td>
<td>Ø 80/100 mm/ 3’/4”</td>
<td>Ø 150 mm/ 6”</td>
<td>Ø 100 mm/4” Wafer</td>
<td>150 mm/6” Wafer</td>
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<td>Ø 300 mm/12” Wafer</td>
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<td>almost any</td>
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<tr>
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*Pressure, power & distance dependent*
COPRA LS – Series for PVD Assist & direct PECVD

COPRA LS-Large Area PECVD Solution for Architectural Glass

COPRA LS950x201 simultaneously working with HiPIMS
The COPRA LS Sources are PVD-Assist and direct PECVD Plasma Sources for box & inline coater setup’s. Different configuration types enable adequate choice of gas types, appropriate PVD-Assist functions and-/or direct PECVD deposition as well as chemical etching. Due to their excellent homogenous distribution of the ion current densities these sources are Large Area capable. The LS-Source Series can work with nearly all types of gases and reach dissociation degrees of up to 90% with plasma densities >1x10^{-12} cm³. The LS-Source Series are easily scalable to serve customized dimensional needs.

### COPRA LS – Series for PVD Assist & direct PECVD

#### Main Applications:
- PVD-Assist Large Area Sputter Assist for precision optics on box and Inline Coater setup’s.
- PECVD \(\rightarrow\) SiO, SiN, DLC...
- Cleaning, Activation, Densification

<table>
<thead>
<tr>
<th>LS Series</th>
<th>LS358x156-GR</th>
<th>LS670x200-GRPE</th>
<th>LS950x200-GRPE</th>
<th>LS1100x200-GRPE</th>
<th>LS1300x200-GRPE</th>
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<td>Plasma Opening</td>
<td>358x156 mm</td>
<td>670x200 mm</td>
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<td>Pressure Range</td>
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<td>6 kW</td>
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<td>850 mm</td>
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<td>Integrated Matchbox</td>
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<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
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</tbody>
</table>

*Pressure, power & distance dependent
COPRA RS – Series for Large Area PECVD

COPRA RS1000x400-DPR PECVD Source opened on both sides

COPRA Large Area Nitrogen Plasma
Large Area PECVD high throughput source solutions for industrial coating markets. The COPRA RS-Series robust design is industrial proven and due to its lowest maintenance costs in particular suited for longer coating campaigns. The RS-Source Series are scalable to serve customized dimensional needs. The Design of the RS-Series paired with the unique features of the COPRA Plasma Technology® can cover substrate widths of more than 3 meter by mounting several RS-Sources InLine one beside the other.

COPRA RS – Series for Large Area PECVD

Main Applications:

- High Rate & Large Area static & dynamic PECVD (SiO, SiN, Al2O3, DLC, α-Si, μ-Si, etc.)
- Plasma Etching (soft/fast)
- Cleaning, Activation

<table>
<thead>
<tr>
<th>RS Series</th>
<th>RS1000x400/300-DPR</th>
<th>RS500x500-DPR</th>
<th>RS850x850-DPR</th>
<th>Ø 400 mm</th>
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<th>RS1050x300-DPR</th>
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<tr>
<td>Plasma Opening</td>
<td>1000x400/300 mm</td>
<td>500x500 mm</td>
<td>850x850 mm</td>
<td>Ø 400 mm</td>
<td>1050x300 mm</td>
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<tr>
<td>Pressure Range</td>
<td>5x10⁻⁴ to 1x10⁻¹ mbar</td>
<td>5x10⁻⁴ to 1x10⁻¹ mbar</td>
<td>5x10⁻⁴ to 1x10⁻¹ mbar</td>
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<tr>
<td>RF-Power (max.)</td>
<td>6 or 10 kW</td>
<td>6, 10 or 15 kW</td>
<td>6, 10 or 15 kW</td>
<td>6, 10 or 15 kW</td>
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<td>Substrate width (dynamic/static)</td>
<td>900 mm/dynamic</td>
<td>400x400 mm/static</td>
<td>700x700 mm/static</td>
<td>Ø 300 (12&quot;) mm/static</td>
<td>Ø 1000 mm/static</td>
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<tr>
<td>Plasma</td>
<td>neutral beam</td>
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*Pressure, power & distance dependent.
COPRA IS – Series for E-Gun/E-Beam Assist & direct PECVD

COPRA IS200 Oxygen Plasma with external Ignition Unit

BAK760 Coater equipped with an COPRA IS200
The IS-Series have been developed for the precision optical coating segment. The Special design allows you to place the source fully in the vacuum chamber and enables low energy Ion assisted deposition (IBAD) by using one source for calotte-/dome sizes of up to 2.2 meter. These E-Gun/E-Beam assisting source types can run with pure gases and drive down significantly your maintenance costs. The IS-Series are hybrid PVD/PECVD capable. This means you can run the PVD Assist and the PECVD with the same source as f.e. DLC coatings for Optics.

COPRA IS – Series for E-Gun/E-Beam Assist & direct PECVD

Main Applications:

- PVD-Assist (Ion Beam Assisted Deposition IBAD) for precision optics
- Cleaning & Activation
- Oxidation, Nitriding, Densification
The CCR Faraday Cup CEA4 Plasma Monitoring System through it allows to precisely measure the plasma parameters as:

- Ion Energy Distribution IED
- Ion Energy
- Ion Current Density
- Ion Energy vs Time

Find out the best operational parameters for your existing and in particular new coater design and processes in order to ensure highest performances of your systems.
Main Features

Operation with nearly any-/pure gases

- The COPRA Plasma Sources can work directly with nearly any gases as also pure gas types as well as gas mixtures. No operation gas is needed.
- This allows to operate directly with the process gases
- The COPRA can operate with pure fluorine based gases
- Even pure H₂ Plasma can be generated easily

Product SCALABILITY!

- scaling sources according customer needs is our daily business!
- Large Area PECVD Solution up to 3.2 m substrate width still available

COPRA Simultaneous Operation

- The design of the COPRA LS- and RS-Series allows you to operate simultaneously with 2, 3 or more sources in a row or next to each other
- This gives you the possibility...
  - to increase your throughput
  - to cover larger substrates
Get in touch!

Should you have any questions regarding our products please feel free to contact us directly. We are pleased to receive your specific request and find an adequate solution which perfectly fits to your needs.

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The COPRA technology is patent protected!
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