Industrial Hot Filament CVDiam® reactors
for polycrystalline diamond growth

- **Global offer**: Consulting, Equipment, Process and Support
- **Full range of equipments and production capacities** to fit all specific customer needs
- **Offer focused on** high quality and reliability
- **User-friendly and safe operations** with versatility

Applications at glance: cutting tools, Microsystems, wear parts, metrology applications, thermal management, electrodes, etc.
Main components

- Horizontal filament holder, tensioning system
- DC power supply
- Stainless steel double-wall reactor
- Gas panel (H₂, CH₄, N₂)
- Pumping system and fine-pressure tuning
- Machine control PLC
- Industrial PC (Windows 7), Touch screen display
- Graphical User Interface (GUI)
- Cooling loop with independent heat-exchanger

Advantages & benefits of our solution

- A global and ready to use solution without any additional investment or R&D development
- A solution suited for different part geometry and manufacturing capacity needs
- Highly adherent diamond coatings on cutting tools with a wide range of microstructure for different applications.
- Low COO and high-capability processes
- Largest deposition surface on the market
- Modern design for facilitating manufacturing and maintenance operations
- High reliability and safety by using high-quality components and interlock management.
- User-friendly and mass-production designed GUI
- Process development with rigorous design of experiments and finite element model

Solution (what we offer)

- HFCVD equipment with custom substrate holder
- Detailed and documented processes
- Installation in your facilities
- Training
- Technical support

NeoCoat’s full range of CVDiam® reactors fulfills all specific needs of customers. Several deposition capacities for lab-scale applications, mass production, industrial applications, R&D projects, etc.

<table>
<thead>
<tr>
<th>CVDiam®</th>
<th>HF 15</th>
<th>HF 30</th>
<th>HF 60</th>
<th>HF 90</th>
<th>HF 120</th>
</tr>
</thead>
<tbody>
<tr>
<td>Layout (mm) H x L x W</td>
<td>1700 x 1200 x 1000</td>
<td>2000 x 1900 x 1200</td>
<td>2000 x 2200 x 1200</td>
<td>2000 x 3600 x 1300</td>
<td>2000 x 4000 x 1300</td>
</tr>
<tr>
<td>Power (KW)</td>
<td>15</td>
<td>30</td>
<td>60</td>
<td>90</td>
<td>120</td>
</tr>
<tr>
<td>Deposition surface (mm) W x L</td>
<td>200 x 200</td>
<td>400 x 280</td>
<td>400 x 580</td>
<td>400 x 880</td>
<td>400 x 1180</td>
</tr>
</tbody>
</table>

CVDiam® reactors with dedicated processes (pretreatment and coating) can be used to produce diamond films with many different specifications.

NCD (nanocrystalline) – MCD (microcrystalline) – various thicknesses – coatings on 3D, microstructured and edged parts – doped or intrinsic diamond – multilayers – Etc.
Diamond coating services

NeoCoat’s team has extensive experience in the development and manufacturing of diamond thin films and their high-tech applications.

NeoCoat’s in-house CVDiam® reactors have the following characteristics:
- HF reactors with deposition surfaces up to 0.5 m²
- Production capacity that allows coating a large number of parts (up to several thousands per week depending on part size).
- MW plasma reactor for single crystal or polycrystalline film growth

NeoCoat is able to grown perfectly closed diamond films (from 70nm up to more than mm thick) on flat, complex or microstructured shapes made of various materials such as Si, Si,N, Si,C, refractory metals, carbides, oxides (fused silica, alumina), ceramics, etc.

Crystallographic structures of NeoCoat’s diamond coatings can be either Nanocrystalline (NCD), Microcrystalline (MCD) or Monocrystalline.

Typical applications and products based on neoDiam™ coatings:
- Diamond coated tools (drill, routers, inserts, etc.)
- Conductive diamond AFM probes
- Diamond coated micromechanical parts
- Diamond coated rotary seals
- Crystalline synthetic diamond parts
- Single crystals of diamond for opto-electronic and jewelry

CVDiam® reactors

NeoCoat team benefits from a 20 year experience in developing diamond CVD reactors (large-scale HFCVD reactors or MWCVD ones).

With deposition area of 0.025m², 0.12m², 0.24m², 0.36m² or 0.50m², the 5 reactors that compose CVDiam® HF range cover all capacity requirements for lab-scale experiments, R&D projects, industrial applications or mass production.

With its deposition area of 2-3m², CVDiam® MW6 allows growing multiple single crystals per batch or thick polycrystalline films.

CV diam® equipments are designed to be user-friendly and safe.
Following characteristics are part of CVDiam® reactors assets:
- Low COO and high-capability processes
- Customizable substrate holders
- Ergonomic design for easy manufacturing & maintenance operations
- High reliability and safety obtained with high-quality components and interlock management
- User-friendly and mass-production designed GUI
- Probably the largest deposition surface on the market!

neoCoat® Electrodes

NeoCoat offers various BDD electrodes, standard or custom ones.

NeoCoat-Electrodes consist in a polycrystalline boron-doped diamond film coated on a substrate, which can be either Silicon, Tantalum or Niobium.

Various boron doping levels are available in a doping range of more than 2 orders of magnitude between the less and the more doped.

NeoCoat’s standard electrodes:
- have simple geometries (discs, squares or rectangles)
- maximum sizes of few hundreds of cm²
- thicknesses in the range of 3 to 5μm

Custom ones can:
- be either very small (few mm²) or very large (up to almost 0.5m²)
- have totally customizable shapes, can be based on rods, grids or meshes
- have thicknesses in the range of 0.1μm to tens of μm
- be based on other substrates than Si, Ta or Nb

Typical applications of NeoCoat-Electrodes:
- Destruction of all microorganisms, water disinfection
- Destruction of dissolved organic pollutants
- Post-harvest drenching of fresh produce & recycling in food processing
- CIP: Clean in place, surface disinfection
- Electroanalytical applications, devices and detectors
- Electrochemical synthesis

neoCoat’s Global Offer

CVD DIAMOND EXPERTISE

DIAMOND GROWTH – EQUIPMENTS – PROCESSES - CONSULTING

- Consulting and careful evaluation of customer needs
- Extensive experience of CVD diamond growth and applications
- A full range of CVDiam® diamond reactors (HFCVD and MWCVD)
- Dedicated pretreatment and diamond deposition processes
- Customized process developments
- Close support for installation, qualification and training
Diamond technology

Diamond is the hardest material in nature. Natural or synthetic diamonds have unique mechanical, chemical and electrical properties. NeoCoat SA has focused its research efforts on the HFCVD (Hot Filament Chemical Vapour Deposition), a process first developed in the early 1990's in which diamond synthesis takes places from a gas mixture at high temperature and under vacuum.

Polycrystalline diamond thin films and boron-doped diamond electrodes have outstanding properties.

Material properties
- Extreme hardness (10'000 Vk)
- Outstanding tribological and dry lubricant properties
- Exceptional heat conduction
- Wide range optical transparency
- High chemical stability
- Biocompatibility
- Interferencial colours

Electrochemical properties
- High overpotential at which water is oxidized
- Generation of a mixture of powerful oxidants
- High oxidation potential to reduce organic load (COD) and eliminate all pathogens

Our Company

NeoCoat SA is a high-tech company active in the field of CVD Diamond Technology. Its thin diamond films have various applications and the company focuses its offer on CVD-diamond solutions either coating services or equipments. NeoCoat's headquarter and production facility are located in the Technology Park Neode, in La Chaux-de-Fonds (NE), Switzerland. The company does business worldwide by developing new applications and products with industrial partner and OEM, and by selling components, products, processes and engineered equipments.

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