Diamond synthesis

through chemical vapour deposition

By Perla Mourad

Who is Element Six

Element Six is a world leader in the production of synthetic diamond and tungsten carbide **supermaterials**

Their mission

Pushing the boundaries of supermaterials performance to produce the **hardest**, most **thermally efficient**, and **optically perfect** materials in order to provide solutions

Abrasives

Automotive & Aerospace

Consumer Electronics

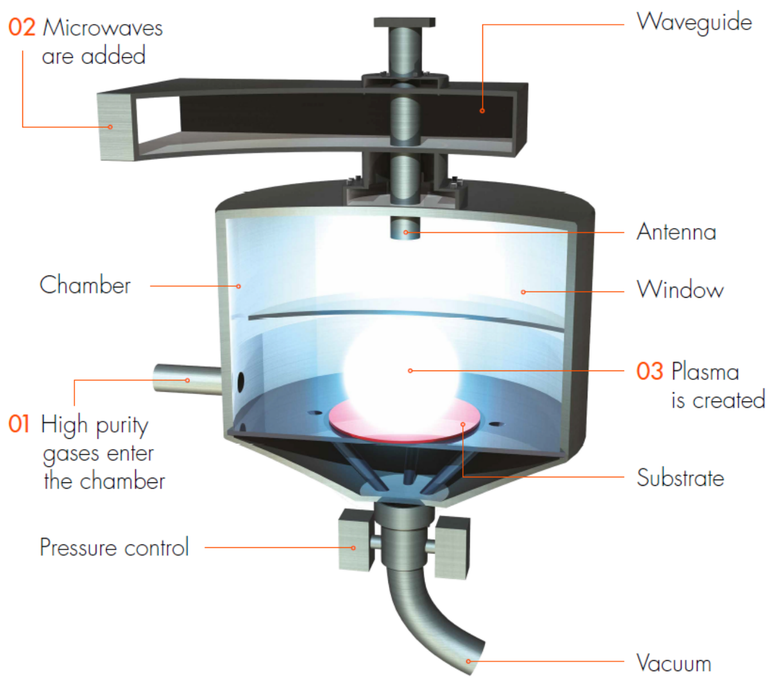
Oil & Gas Drilling

Mining & Road Planing

Technologies

Optical, Thermal & Acoustic

1. CVD synthesis



- **Seeds** are placed inside a vacuum chamber
- **High purity gases** are introduced
- **Microwave energy** is used to ignite a **plasma**, generating reactive particles
- **Carbon species** rain down on the surface
- Diamond grows **atomic layer by atomic layer**

CVD diamond for applications beyond hardness

LIGHTBOX
LABORATORY-GROWN DIAMONDS

2. The Four C's

- Polished diamonds are characterised by **Cut**, **Colour**, **Clarity**, and **Carat** weight
- The **colour** of a diamond is directly related to the **type** and **concentration** of **defects** in the crystal structure
- These defects can be manipulated through synthesis and post synthesis treatments

3. Aim

- Convert the **qualitative** assessment of colour to a **quantitative** assessment (in LAB space) for **colour quality control** through a **colour measurement machine**

4. Outcomes

- I validated the colour measurement machine's exceptional capability through **gauge R&R studies**
- I developed and rolled out process control parameters for the assessment of product colour through **data analysis and statistical methods**
- We integrated measurement metrics to provide an **automated QC tool** for a whole industry
- The **system was agreed across multiple sites and by the customer and was launched internationally** to two production sites