Micro-diamond synthesis – a revolutionary new approach

Abstract
Scientists from Goethe University Frankfurt am Main developed an new method for micro-diamond synthesis.
The method facilitates diamond formation at much lower pressure and temperature compared to established procedures. Multiple successful experiments showed the crystallization of diamonds after only 6-15 hours at 5-7 GPa and 1200-1300°C. These parameters are remarkably lower compared to other industrial applicable methods. In addition the diamonds form without the need of a seed crystal and contain no metal impurities.

Project Status
• Method and prototype show promising results
• Technology ready for tests in an industrial environment

Customer Benefits
• Lower costs of synthetic diamond production due to only 5-7 GPa pressure and 1200-1300°C temperature
• Much faster (<< 1 day) reaction compared to established methods
• No seed crystal needed and no metal impurities
• Method compatible to existing high-pressure-high-temperature methods

Patents
• European priority patent application has been filed in October, 2018
  EP 18203509

Offer
• The technology can be licensed or assigned
• Collaborations regarding further development are welcome

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Apparatus for diamond synthesis and pressure-temperature graph that shows the parameters needed for the synthesis of high-purity diamonds.

Invention
The basic idea about the method is the usage of a carbon-containing fluid instead of graphite for diamond synthesis. Special inner and outer capsules together with an adapted pressure medium have been developed that successfully resolve occurring issues using a fluid medium as starting material instead of a solid, e.g., the stabilization of hydrogen fugacity and inhibition of hydrogen exchange.
The composition of the carbon-containing fluid, the selection of involved high-pressure materials as well as the pressure and temperature parameters have been carefully optimized to produce a remarkable amount of synthesized micro-diamonds.