# Office of Technology Transfer

# Auburn University

## Method of Plasma Enhanced Chemical Vapor Deposition (CVD) of Diamond


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Reference: Plasma CVD


## Inventor


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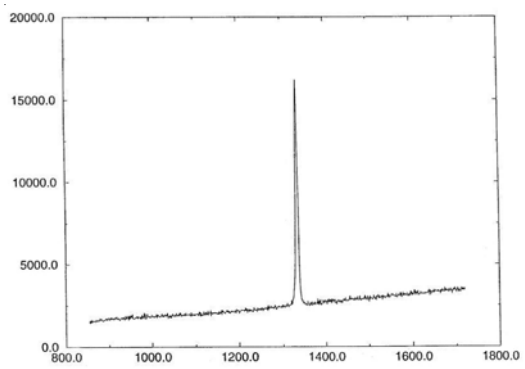
## Overview

Auburn University seeks a licensee or development partner for an invention for improved diamond synthesis via chemical vapor deposition (CVD). Our technology enables the microwave plasma-based growth of high quality diamond crystals and films using a liquid feedstock, creating a cheaper, easier, safer and more flexible process. This technology has the following industrial applications:

- Diamond coated tools for machining hard metals and materials
- IT, including wide band-gap semiconductor devices and heat spreaders for high-powered electrical devices
- Surface acoustic wave devices for microwave communications and sensors
- Optical windows
- Tri-biological coatings, electrochemical coatings and protective coatings




***Raman spectrum of produced diamond film***

## Advantages

- Provides an inexpensive, more efficient and safer method for diamond synthesis
- Eliminates need for compressed gases by using a liquid feedstock
- Provides numerous advantages over standard compressed gas feedstocks:
    1. Reduces feedstock costs by 99 percent
    2. Eliminates the need for costly precision mass-flow controllers
    3. Reduces explosion hazards from compressed gases, improving safety
    4. Allows for continuous operation due to easier replenishment of feedstocks and reduced safety hazards, improving production rates
- Uses existing CVD methods, allowing for easy integration into current systems

## Description

Diamond synthesized by chemical vapor deposition (CVD) has many unique and outstanding properties that make it suitable for a wide range of applications.

Our CVD process provides a method of synthesizing diamond crystals and diamond films using a premixed methanol-based liquid solution as a feedstock without the need for any compressed gases. Methanol is mixed with other carbon containing compounds and passed through an electrical discharge zone such as microwave plasma to generate radicals directed toward a substrate. Diamond is deposited onto the substrate by carbon containing radicals, while OH, H and O radicals preferentially etch or suppress the formation of nondiamond composites on the deposit. The use of a liquid precursor overcomes many of the problems associated with current microwave plasma-based CVD, including high costs and safety issues.

## Status

- Subject of U.S. patent number 7,622,151
- This invention has been successfully verified by laboratory experiment

## Licensing Opportunities

- This technology is available for exclusive or non-exclusive licensing
- Joint development opportunities include funded research or a joint venture

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