

The CUNY Center for Advanced Technology In Photonics Applications (CUNY CAT)
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Advanced Diamond Scalpel

An "intelligent" surgical scalpel with an imbedded MEMS heater and sensors has been developed. This technology deals with the marrying of new diamond substrate nanosensor technology with a diamond surgical scalpel. The diamond scalpel has been known to be a superior surgical instrument. During a surgical procedure, however, tasks such as cauterization, and temperature monitoring may be required.

Diamond, by its nature, is a wide band gap semiconductor. Because of this it can be made either highly insulating (when in pristine state), or conductive (when in a doped state). Besides the intrinsic conductance, a unique property of diamond is that as a carbon material it has capability to be converted into highly conductive graphite. A prototype of an electronic diamond blade capable of in-situ cauterization and temperature monitoring has been developed and prototypes fabricated (Fig. 1). Tests with the electronic diamond knives performed on animal tissue showed an instant cauterization and stable operation of the heater and sensor.

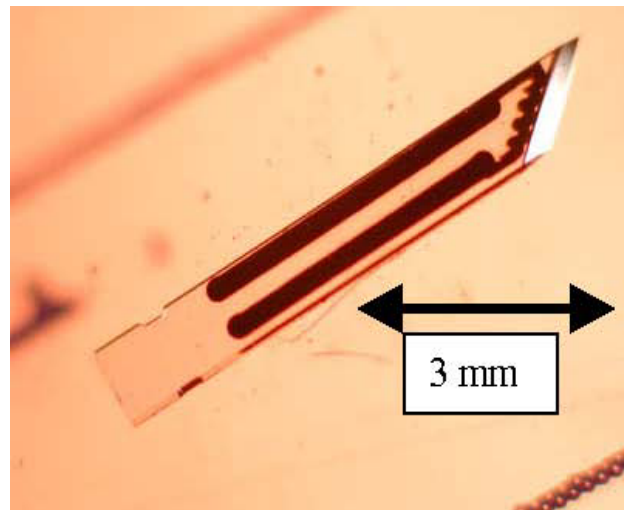


Fig. 1. Electronic surgical diamond blade with embedded microheater and temperature sensor

Using ion implantation is used for electronic structuring of diamond which allows for the fabrication of diverse electronic elements. Future plans include the development of a diamond blade containing a bio/chemical sensor to monitor the cut tissue and blood. Recent experiments with charge sensitive electronic nanostructures on diamond show promising. Electronic structures with carbon nanowires and nanodots made on diamond substrates have been shown to operate as charge sensitive devices (sensors)

Advantages:

- Versatility - diagnostic function, cutting and cauterization.
- Compact - pencil-like holder scalpel does not require bulky equipment like powerful lasers.
- Low Power - Miniature power supply for heater, and sensors, battery powered ultrasonic micro-drive.
- Low Voltage - No special safety requirements. Compatible with computer remote control systems.

This technology opportunity sheet describes continuing efforts in this area. Several patents may have been issued or are pending and which may be available for licensing.

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