

Your CVD diamond solutions partner for electronic and industrial applications, deposition equipment, and diamond technology development



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With more than thirteen years' experience in diamond deposition, sp3 has become a world leader in the production and application of CVD diamond. Today, **sp3 Diamond Technologies** is expanding the use of diamond in electronic and optical applications while **sp3 Cutting Tools** offers a broad choice of standard and custom diamond tools for the most demanding workpiece materials.



## Wafer-scale diamond



Diamond-on silicon and other substrates are now rapidly expanding into applications which include:

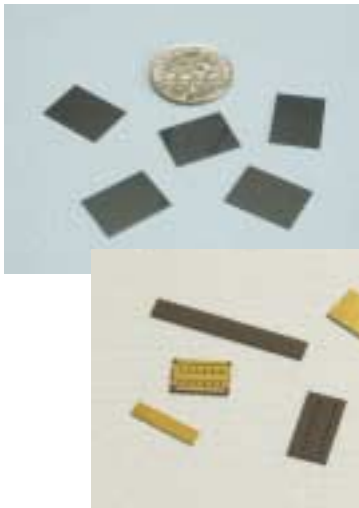
- MEMS
- Amorphous silicon deposition for solar cells and other products
- Active circuit thermal layer
- Substrates for the III-V community
- Silicon-on-insulator (SOI) technology

The high thermal conductivity of diamond enables thin-film diamond coatings to improve thermal management in photonic and microelectronic devices. The high Young's modulus of diamond allows the operational frequency of MEMS RF resonators to be pushed into the GHz frequency bands. And, because of diamond's hardness and low stiction, thin-film diamond coatings may be used to protect MEMS and nanodevices against surface wear.

sp3 hot-filament CVD systems routinely deposit highly uniform diamond films on 50mm, 100mm, 150mm, 200mm and 300mm wafers. Typical film thickness is 0.5 micron to as high as 20 microns.

For more information please visit our website at: <http://www.sp3inc.com/wafers.htm> or, for immediate service, please call us at 877-773-9940.

## Diamond segments



Using DC torch CVD reactors, sp3 produces thick-film sheets of pure diamond that are currently used in two principal applications — thermal sub-mounts and cutting tools.

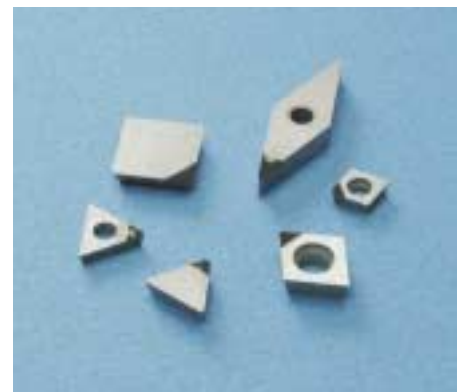
**Thermal sub-mounts** or heat spreaders are used to raise product performance by contributing substantial improvements in heat dissipation. Reduction of junction temperatures of 20+°C have been shown. Segments are typically 400 to 500 microns thick and range in size from as small as 0.5mm square to 25mm square. Heat spreader thermal conductivity is typically 1200 to 1400 W/m<sup>2</sup>K in all three dimensions. In addition to producing thermal segments to a customer's specified dimensions, sp3 offers surface metalization.

For details please visit our website at: <http://www.sp3inc.com/spreader.htm>. We will provide free samples for new applications. Or, for immediate service, please call us at 877-773-9940.

In **cutting tools**, the use of pure diamond eliminates problems with material contamination that frequently stem from the cobalt binder employed in PCD tools. Plus, pure diamond is harder than PCD and provides 2x to 3x longer life.

Diamond segments for cutting tools are typically 500 microns thick and can be custom cut to the customer's specified configuration. Segments can also be supplied as a sandwich with a carbide backing ready for brazing to a steel tool. sp3 will cut and braze diamond sheets to a customer's tools, ready for grinding by the customer. Segments can also be supplied as 25mm square coupons.

For more information please visit our website at: <http://www.sp3inc.com/tool-tip.htm>. We will provide free samples for new applications. Or, for immediate service, please call us at 866-250-9984.



## Cutting tools



sp3 Cutting Tools, located in Decatur, Indiana, specializes in flat and round cutting tools of many configurations, using thin-film and sheet film diamond. A very extensive catalog of standard flat and round tools is available, offering more than 600 tool configurations. sp3 also supplies custom cutting tools and pure diamond tips for tools.

Diamond tools provide exceptional performance in machining abrasive non-metallic materials such as metal matrix composites and non-ferrous metals, with 2x to 3x the life of PCD tools.

Using sp3 hot-filament CVD reactors, sp3 has supplied over a million diamond cutting tools. sp3 has also become the industry leader in the US in face milling aluminum using diamond tools.

For more information on sp3 Cutting Tools please visit our website at:

<http://www.sp3inc.com/hometool.htm>, or for sales and technical assistance call 888-547-4156.

## Deposition systems

sp3 manufactures hot-filament CVD diamond deposition systems for R&D and production applications. sp3 systems feature an integrated process controller that ensures consistent film thickness and grain size for production and flexible control of deposition for R&D.

The broad 350mm x 375mm deposition area accommodates a 300mm wafer or multiple smaller wafers, and allows high volume production of small parts such as cutting tools. Film uniformity is outstanding —  $\pm 15\%$  over the entire deposition area.

A touch-screen display enables process parameters to be seen at a glance and easily modified. A recipe manager facilitates creation and editing of process recipes.



Fixtures are available for coating planar and 3-dimensional arrays, for coating flat and round cutting tools and other substrates, and for coating silicon wafers. sp3 deposition systems are CE approved.



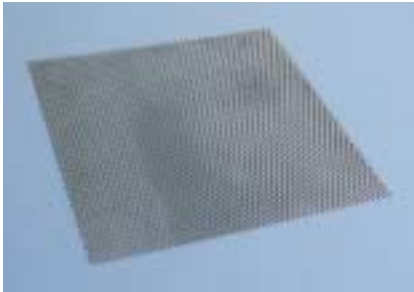
For more information please visit our website at: <http://www.sp3inc.com/reactor1.htm>.

sp3 CVD reactors are distributed world-wide by Seki Technotron, Tokyo. For assistance please call Seki Technotron USA at 888-273-6225 or sp3 at 877-773-9940.

## Coating of cutting tools and other substrates

sp3 has for many years provided a custom or "toll" coating service for manufacturers of cutting tools and for a wide diversity of carbide and other substrates supplied by customers. The hot-filament CVD deposition process allows uniform coating of substrates of almost any configuration.

Diamond coatings can be used to protect surfaces that are subjected to heavy wear. Smooth, adherent diamond coatings afford protection from wear while in many applications imparting lower friction than other materials. Examples of wear parts and seals are shown at right.



Diamond-coated electrodes are used for water treatment and electrochemistry. The photo shows a titanium electrode measuring 12" by 12".



For more information on sp3's coating services please visit our website at: <http://www.sp3inc.com/coat-ovr.htm> or call us at 877-773-9940.

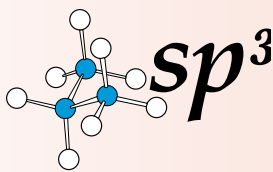
## Contract product and process development

sp3 is engaged in contract development in the fast-moving realm of diamond technologies involving CVD diamond deposition.

Development contracts fulfilled by sp3 include DARPA, the MEMS Exchange (Naval Research Laboratory), the US Air Force, the Missile Defense Agency, Diamonex (CMP pads), a major semiconductor manufacturer, and various advanced technology start-ups.

sp3 is also interested in licensing agreements for sp3's proprietary diamond coating technology. (sp3 holds eleven patents on its technology.)

To discuss contract development please call sp3 at 877-773-9940 or 408-492-0630.



***What is your interest in diamond?  
Let us know and we can help you  
learn more, do more, create more.***



### **sp3, Inc.**

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