Starfire® CVD-189

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POLYMER-TO-CERAMIC™ TECHNOLOGY

Technical Data Sheet

Starfire® CVD-189 (Dimethylisopropylsilane) is a single-source, liquid precursor for chemical vapor deposition (CVD) of high purity silicon carbide (SiC). CVD-189 is in the early stages of application trials but is showing excellent promise as a next-generation precursor with many advantages as compared with methyltrichlorosilane and silane. Although containing carbon and silicon in a ratio of 5:1, coatings applied with CVD-189 at only 825-900°C are a highly crystalline, stoichiometric Beta SiC. During decomposition in the CVD process, CVD-189 is believed to form dimethylsilane radicals which enable the formation of stoichiometric SiC. It has been used successfully for SiC CVD at both reduced and atmospheric pressure, and with and without plasma assist. CVD-189 forms no corrosive byproducts in the CVD process so the environmental impact is very low. Being only very slightly sensitive to air and moisture, handling, transfer and storage are relatively simple.

The table below compares chemistry and deposition conditions for CVD-189 with those of another new Starfire precursor for CVD SiC, CVD-742 (1,1,3,3-tetramethyl-1,3-disilacyclobutane):

Precursor Characteristics and Deposition Conditions	Units	CVD-189	CVD-742
Formula		C5H14Si	C6H16Si2
Molecular Weight		102	144
Boiling Point	(deg. C)	68	120
Deposition Temperature	(deg. C)	825 – 875	750 - 900
Reactor Pressure	(torr)	1 – 760	1 - 760
Reactor Size		15 cm diam X 40 cm long	15 cm diam X 40 cm long
Precursor Input Method		Gas Bubbler	Gas Bubbler
Deposition Rate	(micron/hr)	10 – 30	
Carrier Gas for Precursor Vapor		Hydrogen	Hydrogen
Carrier Gas Flow Rate	(sccm)	10:1 - 100:1	10:1 - 100:1
Coating Crystallinity		Sharp alpha SiC peaks, small beta SiC peak	
Adherence to Substrate		Excellent	Excellent
Precursor Input Rate	(g/min.) (mols/min.)	0.001 0.00001	0.001 0.00001
Flammable		Yes	Yes

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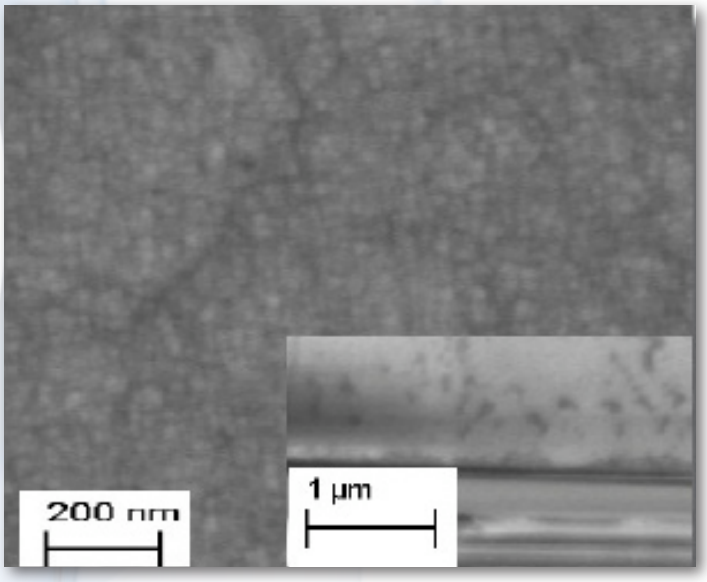
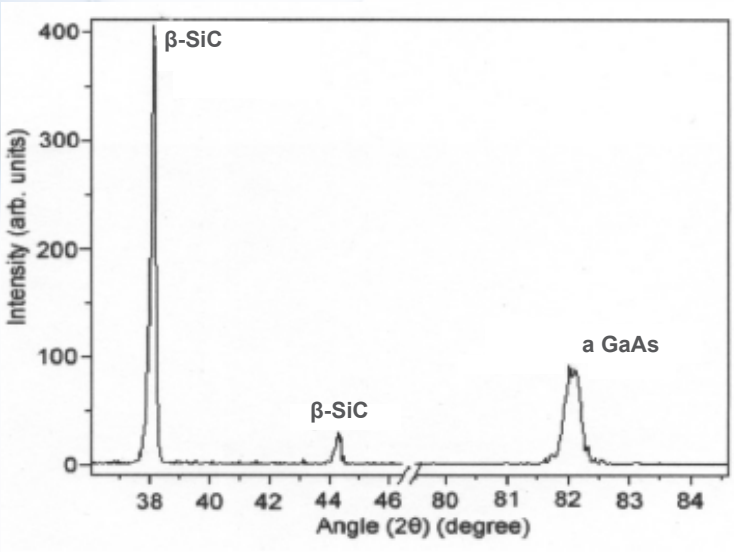
SEM image of SiC film deposited on a silicon wafer at 850°C; insert is cross-sectional view of coating.



XRD Spectrum of SiC Deposited at 850°C for 25 in. at 1 Atmos. (760 torr).
Approximate Growth Rate was 25 micron/hr. and Gas Substrate.



Warranty

No analysis of this product is permitted. The data provided relates only to the material identified above, as supplied by Starfire Systems®, Inc. (SSI). Because conditions and methods of use of our products are beyond our control, this information should not be used as a substitution for customer's tests to ensure that SSI's products are safe, effective, and fully satisfactory for the intended end use. SSI's sole warranty is that the product will meet sales specifications in effect at the time of shipment.

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Furnace and Venting Precautions:

Under complete decomposition and pyrolysis, hydrogen, methane and propane are the only byproducts of CVD-189 making it far more compatible with equipment, personnel and the environment than traditional halide-based precursors for CVD-SiC. When beginning use of CVD-189, care should be taken to determine if byproducts are accumulating in the downstream components and whether they are air sensitive. Exhaust pipes, particle traps or the vacuum pump must be removed carefully and exposed to air slowly. During deposition, a section of pipe heated to 1000°C or higher (located after the deposition chamber and before the vacuum pump) will destroy all or most of the air-sensitive chemicals. If a vacuum pump is used then a particulate trap is recommended prior to the vacuum pump. A chemical trap may also be used before the vacuum pump, which will neutralize any organic compounds and also trap particulates.

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