Nevada Thermal Spray Technologies
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NTST Silicon Nitride (Si3N4) Coatings

General Information:

NTST has recently developed the unique capability to fabricate Si3N4 coatings. The coating is extremely difficult to fabricate due to its tendency to sublime at high temperature. It is a high-temperature coating that is relatively chemically inert and very hard.

Si3N4 Material Properties and Coating Characterization:

Silicon nitride has better high temperature capabilities than most metals. Benefits include low density, high temperature strength, superior thermal shock resistance, excellent wear resistance, high hardness and toughness, resistance to mechanical fatigue and creep, and good oxidation resistance. Porosity is less than 2% and bond strength exceeds 5000 psia.

Property information below is taken from various sources. This includes both coating and thin film data. These properties are only approximate and vary substantially for thermal spray coatings.

Mat	Hard Mohs	Rough Microinch as-sprayed	DecompT F (K)	Density Kg/m3	Thermal Conduct W/m-K	CTE C	Dielect Strength V/mil
Si3N4	8.5	Rz1716 Ra 343	3452 (2173)	3250	43	3.7	304-420

Silicon Nitride Applications:

Current applications are found in the automotive, industrial bearing, aerospace, medical, and electronics industries. The largest market for silicon nitride automotive components is in engines and wear components. This includes glow plugs, combustion chambers, turbochargers, and exhaust gas control valves. The wear resistance, low friction, and high stiffness of silicon nitride improves the performance of high temperature bearings. Figure 1 illustrates typical NTST silicon nitride coatings (i.e. 5 and 10 mils thick). Figure 2 illustrates the as-sprayed surface morphology of a typical NTST Si3N4 coating (160x).

Figure 1. Typical NTST silicon nitride coatings

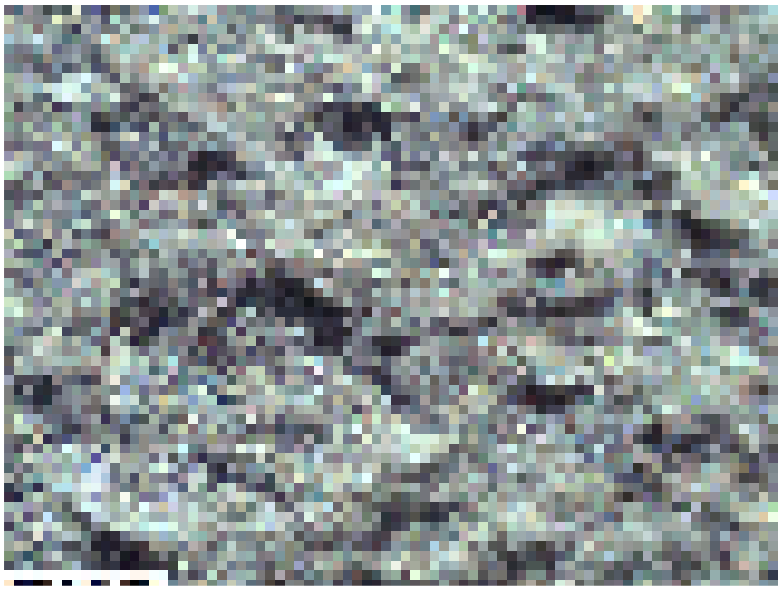

Figure 2. As-sprayed surface morphology of NTST Si3N4 coating (160x).