

3M™ Ceramics for Oil and Gas Applications

The proven 3M™ Ceramic Sand Screens offer a breakthrough sand and proppant flowback control technology delivering unparalleled erosion and corrosion resistance in demanding oil and gas well applications. 3M ceramic sand screens are made of advanced ceramic materials that offer unique advantages for the oil and gas industry, including outstanding hardness and exceptional resistance to wear, corrosion and extreme temperatures.

3M Technical Ceramics is a pioneer in the field of non-oxide ceramics and has more than 85 years of experience in designing and manufacturing cutting-edge ceramic solutions.

All of our knowledge and experience is reflected in the performance of 3M™ Ceramic Sand Control Screen Systems, which deliver higher efficiency and longer service life than conventional sand screen systems.

One of the most prominent of these materials is silicon carbide, mostly known and used for machining and grinding the hardest steels. This synthetic material shows extreme hardness, abrasion resistance, high temperature strength and chemical inertness which is unparalleled – the ideal material when severe abrasion and heavy chemical attack threatens parts and functionality in the oil and gas industry.



Material Comparison (Not for specification purposes.)

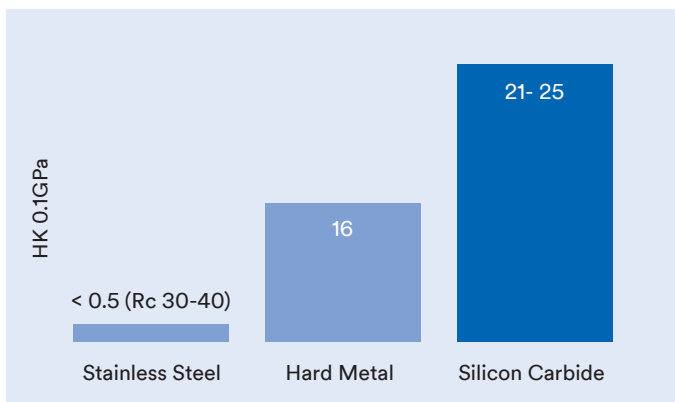
Material properties	Units	Stainless Steel	Hard Metal	3M™ Silicon Nitride	3M™ Silicon Carbide
Knoop hardness	HK 0.1GPa	<0.5 (Rc 30–40)	16	14.5	21–25
Compressive strength	MPa	2200	5000	>2500	2200–2500
Thermal conductivity at 20°C	W/(mK)	35–45	95	25–40	75–125
Density	g/cm ³	7.8	14.9	3.2	3.1–3.2
Flexural strength (4 point bending)	MPa	N/A	1550	700–800	400–650
Young's modulus	GPa	200	520–620	310	410
Fracture toughness K _{IC}	MPa m ^{0.5}	N/A	10–20	6	4–6



Knoop Hardness

The higher the hardness, the lower the erosion.

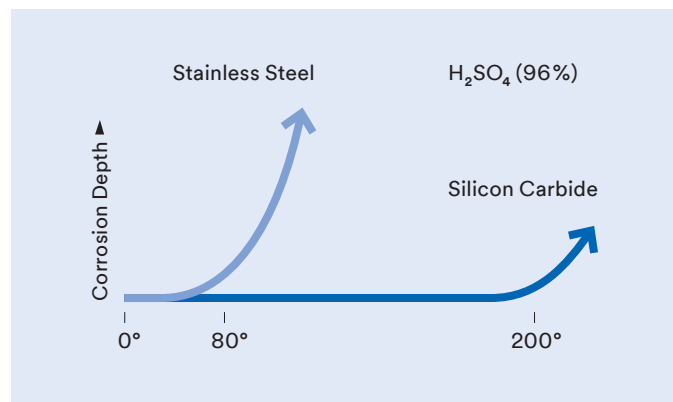
- Almost as hard as diamond and 10 times harder than stainless steel
- Exceptional wear resistance when exposed to sand



Temperature vs. Corrosion

Silicon carbide easily survives acids and bases at higher temperatures and covers all known application temperatures.

- Corrosion resistant against chlorides, hydrogen sulfide or hot sulfuric acid
- Proven performance in millions of ceramic seal and bearing applications in the chemical industry



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