

Description

Ceramax I is an effective high strength proppant. Use of the **SBC** resin system to encase a lightweight ceramic provides a proppant with minute crush and very high flow capacity. Bluish-gray in color, **Ceramax I** resists cyclic stressing for long term performance and proppant flowback prevention. The **SBC** resin provides high strength bonding in the fracture with closure while virtually eliminating wellbore consolidation. The highly successful **SI** (strength intensified) version of the **SBC** resin is standard with **Ceramax I**.

Application

The suitable applications for **Ceramax I** are:

- At closure stress of 6,000 to 14,000 psi
- At bottom hole static temperatures up to 450°F [232°C]
- In the prevention of proppant flowback
- When wellbore clean out is a concern
- When stress cycling is common

Technical Advantage

- Extreme low crush and fines
- Patented breaker friendly resin system
- Improved frac fluid compatibility
- Better wettability for mixing and foams
- Consolidates with closure in the fracture
- Slight to no consolidation in the wellbore

Benefit

- High strength proppant performance
- Reduces cost of wellbore clean out(s)
- Sustained well productivity
- Low bulk density for better placement
- Prevents expensive maintenance costs and safety concerns associated with proppant production

Technical Considerations

- Grain to grain contact must occur and closure stress must be applied, during the cure period for proper bonding.
- Consolidation of curable products, at bottom hole static temperatures below 160°F [71°C], is achieved by use of a low temperature consolidation aide, such as, **AcTivator™** or the proper concentration of selected alcohols.

Chemical Properties		Typical
Composition	SBCyclic resin coated	
	Light weight ceramic proppant	
Resin type	thermosetting	
	partially-cured, phenolic	
Color	bluish-gray	
Odor	slight	
Equilibrium pH*		8.5
Residual acidity* ,		
	gal 50% NaOH/1000 gal 2% KCl	< 0.4
Solubility , weight %		
	in water, brine & HCl	nil
	in HCL/HF acid, <i>API RP-56</i>	0.3
	in oil	nil
	in alkaline water* (uncured)	< 10.0
	(cured)	< 3.0
Shelf-life , year		> 3
Compatibility	Fully compatible with most, if not all, commonly used fracturing fluids, both water and oil based systems. Testing with fluids prior to pumping is advised. Some fluids may require adjustment of pH control, breaker, or foamer loading. Avoid prolonged exposure to highly alkaline fluids (pH > 12 and/or > 2.2 gal 50% NaOH/1000 gal).	

* 180°F[82°C], unbuffered 2% KCl, adjusted to pH = 11, 12 lb_m/gal added

Physical Properties		Typical
API mesh size		16/20, 20/40
Physical state		solid particulate
Particle density ,		
	g/cm ³ [lb _m /gal]	2.66 [22.2]
Specific volume ,		
	cm ³ /g [gal/lb _m]	0.376 [0.0450]
Bulk density ,		
	g/cm ³ [lb _m /ft ³]	1.60 [100±4]
Pipe-fill factor ,		
	cm ³ /g [gal/lb _m]	0.625 [0.0749]
Krumbein shape factors ,		
	roundness	0.9
	sphericity	0.9
Particle size distribution ,		meets or exceeds <i>API RP-60</i>
Turbidity , NTU (FTU)		< 250
Coating efficiency , weight %		> 99.7
Clusters , weight %		< 1
API Crush Resistance* ,		
	weight % fines generated	
	20/40 mesh @ 10,000 psi	0.2%
	20/40 mesh @ 12,500 psi	0.7%
Compressive Strength , psi		See cure rate curve in this section.

* fully cured version



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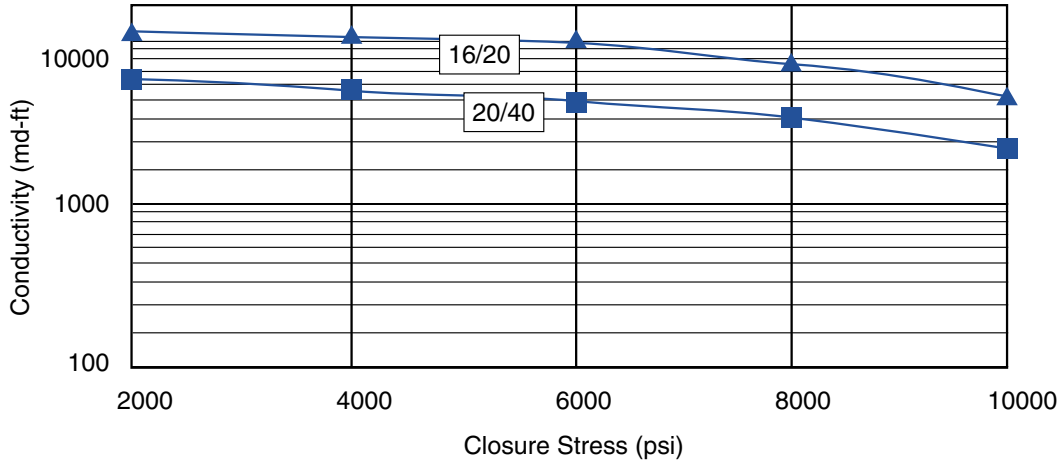
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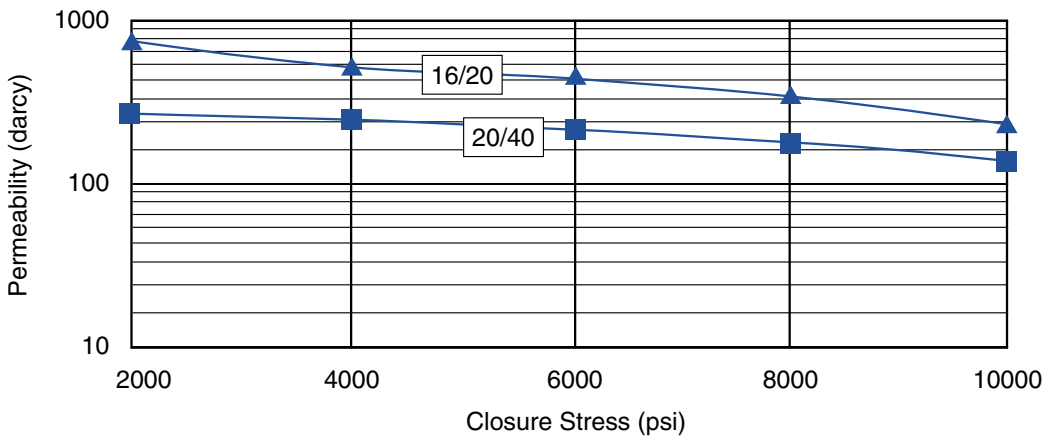
Long-term Conductivity and Permeability

Stim-Lab, Inc. Proppant Consortium Baseline Procedure

Closure Stress (psi)	2,000	4,000	6,000	8,000	10,000
Size	Conductivity (md-ft)				
16/20	12613	10593	9630	7674	5260
20/40	6324	5613	4960	4004	2621



Closure Stress (psi)	2,000	4,000	6,000	8,000	10,000
Size	Permeability (darcy)				
16/20	652	554	511	415	296
20/40	334	301	271	225	154

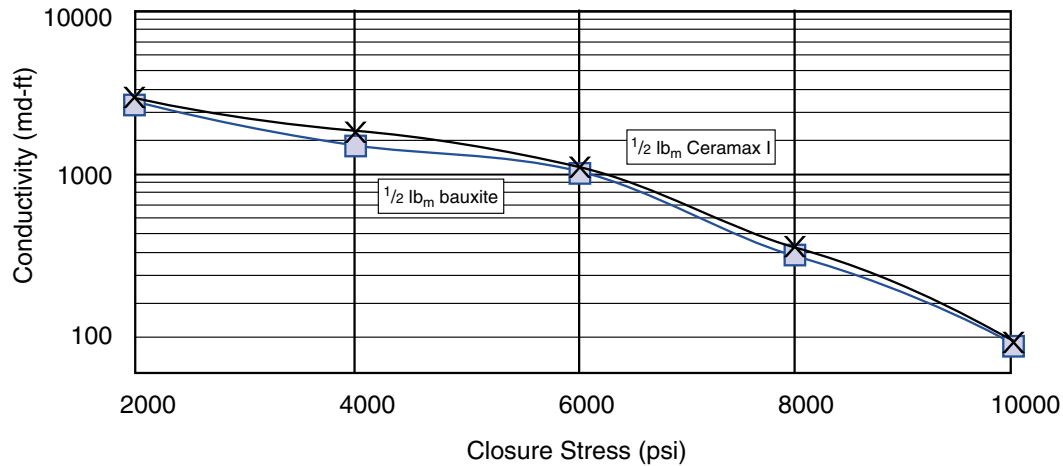


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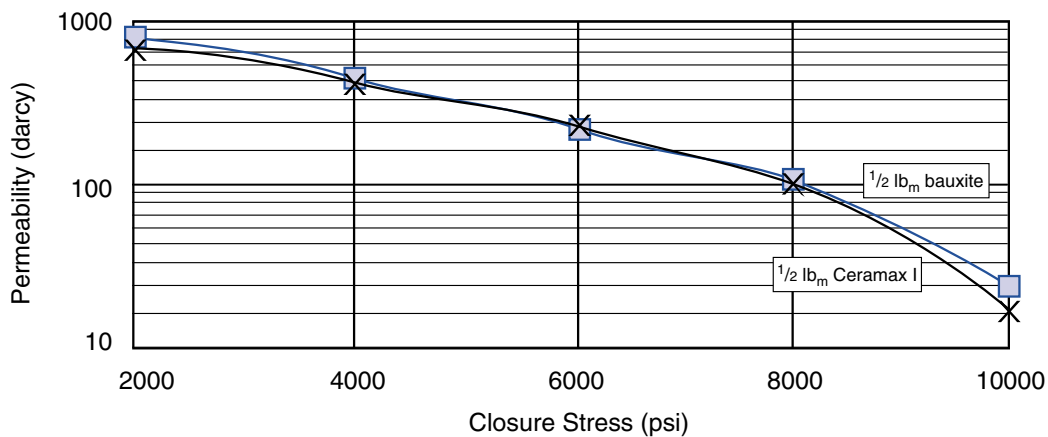
Long-term Conductivity and Permeability

Stim-Lab, Inc. Proppant Consortium Baseline Procedure

Closure Stress (psi)	2,000	4,000	6,000	8,000	10,000
Size	Conductivity (md-ft)				
1/2 lb Ceramax I 20/40	3526	2320	1267	431	89
1/2 lb Bauxite 20/40	3237	1896	974	388	85



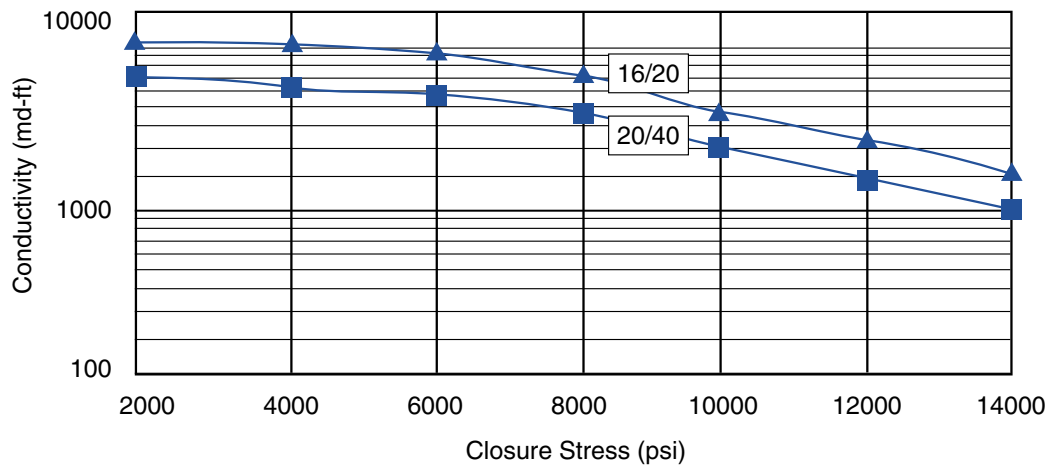
Closure Stress (psi)	2,000	4,000	6,000	8,000	10,000
Size	Permeability (darcy)				
1/2 lb Ceramax I 20/40	717	488	287	106	23
1/2 lb Bauxite 20/40	827	506	278	123	30



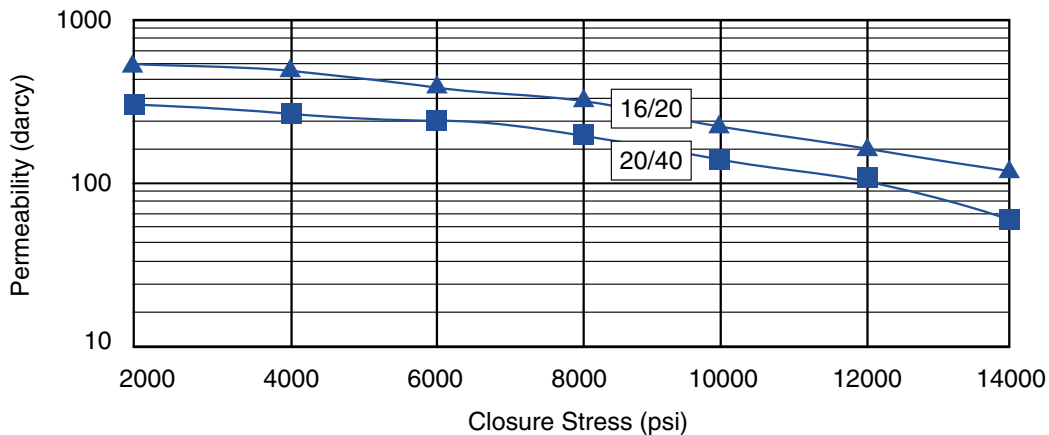
Long-term Conductivity and Permeability

Stim-Lab, Inc. Proppant Consortium Baseline Procedure

Closure Stress (psi)	2,000	4,000	6,000	8,000	10,000	12,000	14,000
Size	Conductivity (md-ft)						
16/20	11612	10709	9187	7237	4721	3384	2153
20/40	7103	6297	5642	4693	3011	1978	1076

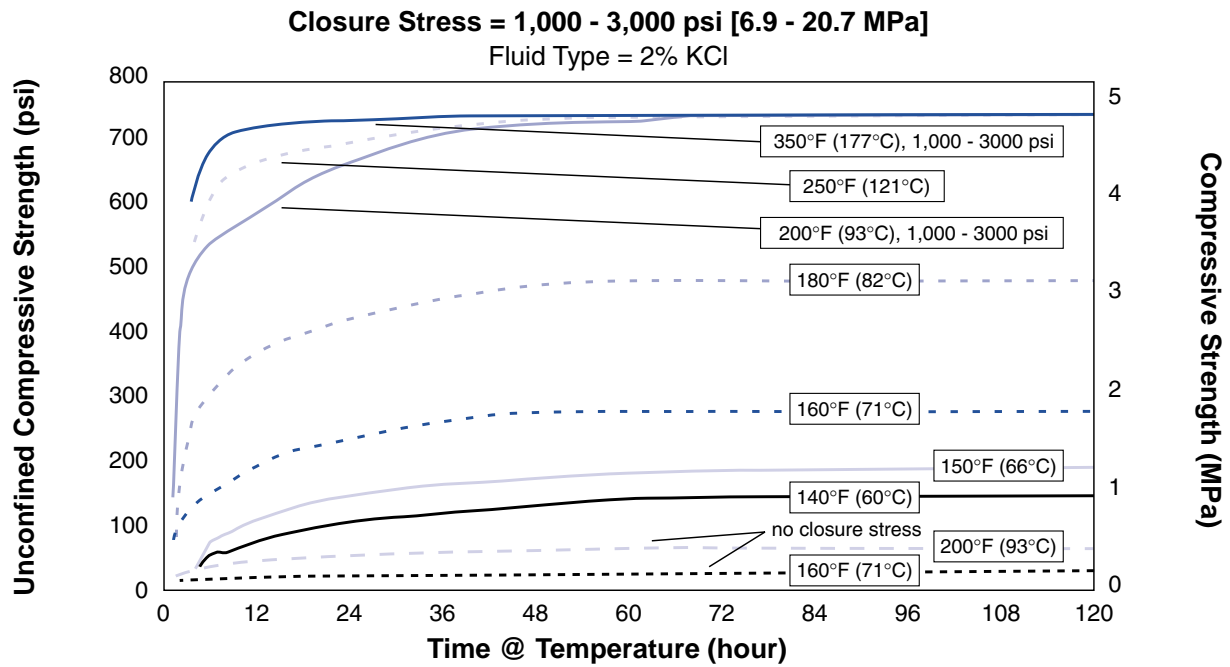


Closure Stress (psi)	2,000	4,000	6,000	8,000	10,000	12,000	14,000
Size	Permeability (darcy)						
16/20	596	554	488	398	271	202	135
20/40	370	331	301	256	174	119	68



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Effect of Temperature on Cure Rate



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