

CARBOPROP®

Cost-effective, intermediate-strength proppant

FEATURES

- Excellent crush resistance in a broad range of applications.
- Effective at closure stresses to 14,000 psi.
- Frequently selected for moderate depth oil and gas wells.
- Available in three standard sizes – 16/30, 20/40 and 30/60.
- Also available in 40/70 and 100 mesh sizes for gravel pack, frac pack and fracture leakoff applications.

Physical and Chemical Properties

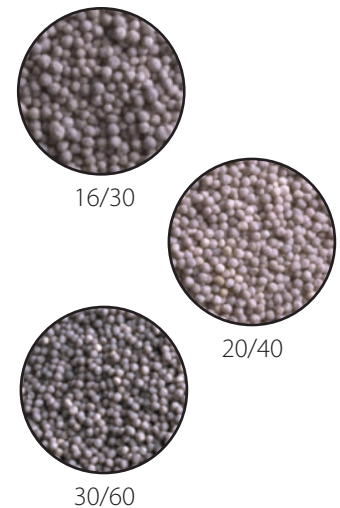
Typical Sieve Analysis [weight % retained]

U.S. Mesh [mesh]	Microns	16/30	20/40	U.S. Mesh [mesh]	Microns	30/60	40/70
+16 mesh	+1180	1	—	+20 mesh	+850	—	—
-16+18 mesh	-1180+1000	33	—	-20+30 mesh	-850+600	1	—
-18+20 mesh	-1000+850	52	3	-30+50 mesh	-600+300	94	49
-20+30 mesh	-850+600	14	65	-50+60 mesh	-300+250	4	32
-30+40 mesh	-600+425	—	32	-60+70 mesh	-250+212	1	17
-40 mesh	-425	—	—	-70 mesh	-212	—	2
Median Particle Diameter [microns]		928	658			443	300
API Crush Test							
% by weight fines generated @10,000 psi		3.2	2.2			2.3	2.0
	@12,500 psi	6.1	5.1			—	—

Sizing Requirements: A minimum of 90% of the tested sample should fall between the designated sieve sizes. These specifications meet the recommended practices as detailed in ISO 13503-2.

Typical Additional Properties

Roundness	0.9	Chemistry [weight %]	
Sphericity	0.9	Al ₂ O ₃	72
Bulk Density [lb/ft ³]	117	SiO ₂	13
[g/cm ³]	1.88	TiO ₂	4
Apparent Specific Gravity	3.27	Fe ₂ O ₃	10
Absolute Volume [gal/lb]	0.037	Other	1
Solubility in 12/3 HCl/HF Acid [% weight loss]	4.5		



Long-Term Conductivity

Reference Conductivity*, md-ft @ 250°F

Closure Stress [psi]	2 lb/ft ² 16/30	2 lb/ft ² 20/40	2 lb/ft ² 30/60	2 lb/ft ² 40/70
2,000	17,100	6,180	2,870	1,680
4,000	12,980	5,430	2,438	1,350
6,000	10,190	4,450	2,007	1,015
8,000	6,540	3,720	1,576	770
10,000	4,355	2,890	992	570
12,000	2,630	2,145	667	440
14,000	—	1,445	—	—

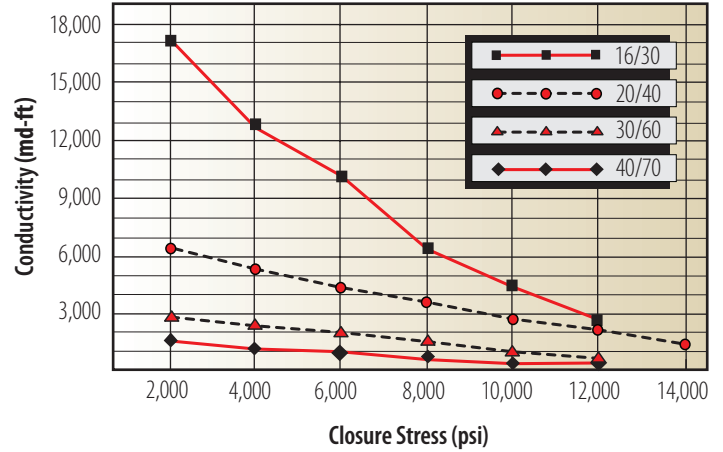
Reference Permeability, Darcies @ 250°F

Closure Stress [psi]	2 lb/ft ² 16/30	2 lb/ft ² 20/40	2 lb/ft ² 30/60	2 lb/ft ² 40/70
2,000	1,050	385	174	140
4,000	800	345	152	110
6,000	640	290	128	80
8,000	420	250	104	65
10,000	300	200	69	50
12,000	190	150	49	40
14,000	—	100	—	—

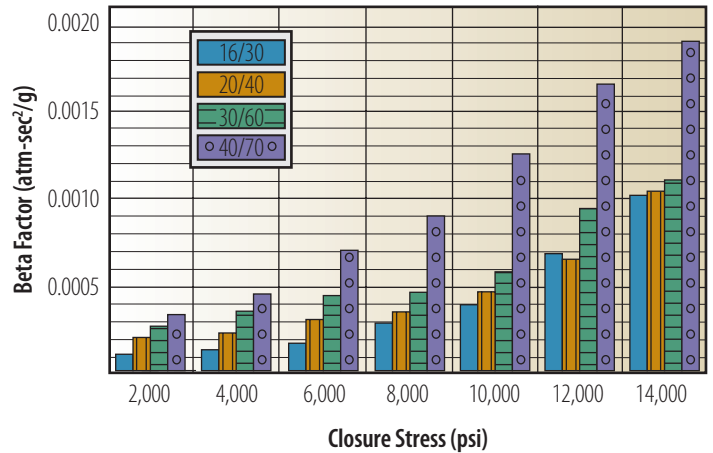
Beta Factors

Closure Stress [psi]	Beta Factor [atm-sec ² /g]			
	16/30	20/40	30/60	40/70
2,000	0.00010	0.00021	0.00027	0.00035
4,000	0.00013	0.00024	0.00034	0.00047
6,000	0.00017	0.00030	0.00044	0.00070
8,000	0.00028	0.00037	0.00047	0.00091
10,000	0.00043	0.00049	0.00059	0.00127
12,000	0.00072	0.00069	0.00093	0.00167
14,000	0.00103	0.00106	0.00115	0.00191

2 lb/ft², 250°F, with 2% KCl | Between Ohio sandstone



2 lb/ft², 250°F, with 2% KCl | Between Ohio sandstone,
Young's modulus of 5x10⁶ psi | No gel damage included



Beta Factor data reported by Stim-Lab Consortium, PredK Feb 2002

* Reference conductivity and permeability are measured with a single phase fluid under laminar flow conditions in accordance with ISO 13503-5. In an actual fracture, the effective conductivity will be much lower due to non-Darcy and multiphase flow effects. For more information, please refer to SPE Paper #106301.

CARBO Ceramics

Energy Center II
575 N. Dairy Ashford, Suite 300
Houston, Texas 77079 USA
T: 1+281-921-6400
F: 1+281-921-6401
CarboCeramics.com

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