CARBOBOND KRYPTOSPHERE HD

Resin-coated high-density, ultra high-performance ceramic proppant

Features

- KRYPTOSPHERE HD provides an ultra-conductive, high-density proppant as the substrate
- Specially formulated for maximum compatibility with complicated frac fluids used in deepest of wells
- Bonded proppant pack reduces effective stress on proppant
- High cyclic loading tolerance
- Resin coating completely encapsulates substrate
- Bonds in the fracture with temperature and closure

Benefits

- Resiliant - locks the high performance ceramic proppant in place, keeping the fracture open in the harshest of conditions
- No proppant flowback—eliminates subsequent equipment damage, expense of cleanouts and disposal
- Maintains conductivity—resin coating prevents fines from being released
- Maintains particle integrity—prevents chemical attack on substrate
- No additional chemical costs—since no fluid chemistry change is required, the job can be pumped as designed

Locks the high-performance ceramic in place

KRYPTOSPHERE® HD is an ultra-conductive, high density ceramic proppant technology, specifically engineered for high closure stress and risk environments, including ultra-deepwater regions such as the Gulf of Mexico. When proppant flowback is a concern, CARBOBOND technology will lock the conductivity in place. It is designed for high cyclic loading tolerance, and reduces the effective stresses encountered at deeper depths.

Long-term conductivity

Reference conductivity, md-ft @ 250˚F (121°C)

Closure stress psi	25 Mesh
8,000	3,590
10,000	3,290
12,000	2,980
14,000	2,670
16,000	2,280
18,000	1890

Reference permeability, Darcies @ 250˚F (121°C)

Closure stress psi	25 Mesh
8,000	250
10,000	230
12,000	216
14,000	195
16,000	169
18,000	145

Reference conductivity and permeability are measured with a single phase fluid under laminar flow conditions in accordance with API RP 19C. 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.

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Physical and chemical properties

Typical chemical properties

Resin type	Proprietary Phenolic
Equilibrium pH	8.9 - 9.3
Residual acidity per gal 50% NaOH/1000 gal 2% KCl	< 0.1
Shelf-life (years)	> 3 estimated
Solubility: ISO 13503-2	**Weight %**
Water	< 0.2
Alkaline water* uncured	< 1.0
Alkaline water* cured	< 0.2
Water with 2% KCl	< 0.2
Light brine	< 0.3
12% HCl/3% HF Acid	< 1.0
Oil	< 1.0

*66°C, unbuffered 2% KCl, adjusted to pH = 11, 1.4 kg/L added

Compatibility: Compatible with most commonly used fracturing fluids, both water and oil. 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, i.e., pH > 12 and > 2¼ gal 50% NaOH/1000 gal (2.2 L/m3).

All data represents typical values.

Typical physical properties

Available sizes	20, 25, 35
Substrate	KRYPTOSPHERE HD
Physical state	Solid, particulate
Apparent specific gravity	3.27 ± 5
Specific volume (cm^3/g)	0.037
Bulk density [lb/ft^3] (g/cm^3)	117 ± 4 1.87 ± 0.06
Roundness	0.9
Sphericity	0.9
Particle size distribution uncoated ceramic substrate	Meets or exceeds API RP 19C
Turbidity, (NTU) [FTU]	< 250
Coating efficiency (weight %)	> 99.8
Bond strength	*1360 psi UCS at 250 F
Long-term conductivity	See included chart

*For bottomhole static temperature (BHST) less than 150°F/65°C use CARBOBOND Low Temperature Chemical Activator (LTCA) to enhance bond strength. LTCA may also be beneficial in cold weather conditions.

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