DATA SHEET

HALLIBURTON

Cementing Solutions
Cement Sytems and Additives

CorrosaCem™ Cement System

Reduced Portland cement solution for corrosive CO_2 environments

FEATURES

- Reduced chemical reaction with CO_2
- Modified to reduce permeability and enhance elasticity

BENEFITS

- Enhanced corrosion resistance
- Improved mechanical properties minimize the impact of cyclic injection

Overview

Cementing wells for carbon capture, utilization, and storage (CCUS) presents unique challenges to barrier integrity and long-term stored CO_2 containment. CCUS projects aim for permanent underground CO_2 storage, which requires long-term cement sheath chemical and mechanical stability. Factors like temperature and pressure cycles and chemical interactions can impact the cement integrity over time. CO_2 produces carbonic acid in the presence of water, which can degrade conventional Portland cement. Cement used with CCUS applications must be resistant to CO_2 exposure.

CCUS involves the injection of CO_2 deep into subsurface formations, typically at significant pressure. For this reason, cement slurry design and placement techniques must ensure proper bonding of cement to the wellbore and formation to provide a reliable and impermeable seal. Halliburton has decades of experience with the design of annular barriers for corrosive environments. We recognize the importance of proper material selection and best practices for long-term CO_2 storage. CorrosaCem cement system is part of the Halliburton CCUS solutions portfolio. The system is a reduced Portland-based cement designed to lessen the chemical alteration effects caused by CO_2.

Tailored to help reduce permeability and enhance elasticity

CorrosaCem cement system is designed to minimize components that readily react with CO_2. Supplementary cementitious materials (SCMs), that do not react with CO_2, replace the Portland cement in the system. This feature enhances the CO_2 corrosion resistance of the system. The modification of the blend with other additives lowers the permeability of the system, which mitigates the potential for CO_2 to penetrate the cement matrix. Elastomers and fibers enhance the system's elasticity to provide a more ductile barrier. This enables a more crack-resistant system to help withstand downhole forces during cyclic injection compared to conventional Portland systems.

CCUS solutions portfolio

The Halliburton CCUS solutions portfolio includes non-Portland, modified Portland, and reduced Portland products. These solutions use tailored chemistries, pure resin, cement and resin composites, and additives to enhance mechanical properties. They also reduce the set cement permeability and deliver an improved CO_2-resistant barrier with long-term integrity. The CorrosaCem system is part of our reduced Portland solutions portfolio.

(left - Portland cement; right - CorrosaCem™ cement) Phenolphthalein, a pH stain, provides visual cues of carbonation. Purple represents unaltered cement. The results of CorrosaCem cement after one month of static supercritical CO_2 exposure at 100°F show improved resistance to CO_2 chemical alteration compared to conventional Portland cement.

Post-exposure mechanical properties results

SAMPLE	1 WEEK	1 MONTH	5 MONTHS
Compressive strength (psi)	8,831	9,281	10,128
Young's modulus (psi)	3.07E+06	3.55E+06	3.30E+06
Poisson's ratio (-)	0.252	0.253	0.296

No noticeable deviation in the CorrosaCem™ cement system mechanical properties after five months of supercritical CO_2 exposure.

For more information, contact your local Halliburton representative or visit us on the web at www.halliburton.com

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