EverCRETE
CO₂-resistant cement system

**APPLICATIONS**
- Carbon capture and storage injection wells
- Enhanced oil recovery CO₂ injection wells

**BENEFITS**
- Longer-lasting zonal isolation in CO₂ underground storage and injection because the EverCRETE® CO₂-resistant cement system is resistant to degradation when exposed to a CO₂ environment

**FEATURES**
- Temperature up to 266 degF [130 degC]
- Wide density range of 12.5 to 16 lbm/USgal [1,497 to 1,917 kg/m³]
- Mixing and pumping with standard equipment
- Compatibility with portland cement

**CO₂ isolation challenges**
Portland cement systems are used conventionally for zonal isolation in oil or gas production wells. However, portland cement is thermodynamically unstable in CO₂-rich environments and can degrade rapidly upon exposure to CO₂ in the presence of water.

As CO₂-laden water diffuses into the cement matrix, the dissociated acid (H₂CO₃) reacts with the free calcium hydroxide and the calcium silicate hydrate (C-S-H) gel. The reaction products are soluble and migrate out of the cement matrix. Eventually, the compressive strength of the set cement decreases and the permeability and porosity increase, leading to loss of zonal isolation.

**CO₂-resistant isolation solution**
With the EverCRETE system, Schlumberger has developed
- CO₂-resistant cement system to extend the duration of zonal isolation
- testing methodology using a computer-controlled titanium reactor to assess the long-term durability of cement cores under well CO₂ conditions.

In laboratory tests, the EverCRETE system has proved to be highly resistant to CO₂ attack from wet supercritical CO₂ and CO₂ water saturation.

EverCRETE system can be prepared locally using the standard bulk plant. The density can be tailored to well requirements, providing operational flexibility.

**CO₂ durability test reactor**
Cement cores are tested simultaneously in supercritical CO₂ that is saturated with water and in CO₂ water saturation under downhole temperature and pressure conditions.
Compressive strength evolution of portland cement and EverCRETE system samples with time in wet supercritical CO₂ fluid and in CO₂-saturated water at 90 degC under 28 MPa of pressure. After 6 months in CO₂-saturated water, the compressive strength of portland cement is not measurable because most of the samples are highly deteriorated.

This system is compatible with portland cement. EverCRETE system can be used with conventional portland cement slurries, depending on the requirements for CO₂ resistance. EverCRETE system can be used as a tail slurry across a CO₂ injection zone or as a lead slurry to protect the casing string from CO₂ attack in front of any reservoir with CO₂ contact. It can be prepared and pumped using standard equipment.

**Carbon storage**

Carbon capture and storage is becoming a critically important part of global warming mitigation efforts, and this trend is expected to continue, with more and more wells being drilled for this purpose. Well integrity has been identified as the biggest risk contributing to leakage of CO₂ from underground storage sites.

Schlumberger offers a total solution with services for the entire process, from selecting the reservoir to isolating CO₂-sequestration zones to monitoring the CO₂ plume in the reservoir after injection.

**CO₂-enhanced oil recovery**

CO₂ injection wells can be used to increase reservoir pressure to recover oil in existing wells. This oil recovery methodology contributes to CO₂ underground storage, reducing emissions to the atmosphere.

During the CO₂ injection process, cement can be affected, which can compromise the integrity of the project. EverCRETE system reduces the risk of CO₂ degradation and leakage and can be used to cement new CO₂ injection wells or plug and abandon existing injection and production wells at the end of the project.