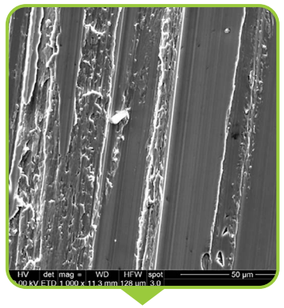
NETL FILES PATENT FOR HYDROPHOBIC CARBON CAPTURE SOLVENT THAT REDUCES CORROSION OF STEEL TO LOWEST REPORTED LEVELS

New hydrophobic solvent CASSH-1 shows potential for extending equipment lifetime for pre-combustion carbon capture processes.

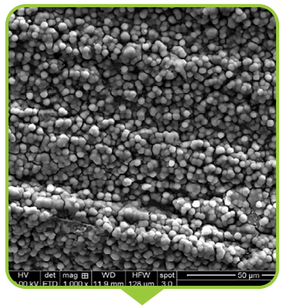
NON-CORROSIVE SOLVENT CAN LOWER CARBON CAPTURE COSTS

Extending the lifetime of process equipment can decrease capital expenses

- Pre-combustion carbon capture processes rely on solvents that can capture carbon dioxide (CO_2) at high capacity and selectivity over hydrogen in the presence of water.
- Solvents with hydrophilic properties tend to corrode both stainless and carbon steel, which are common equipment materials for absorbers.
- Rapid corrosion can result in equipment replacement and higher operating costs, driving the need to develop high-performance, non-corrosive solvents for carbon capture, including CASSH-1.



Carbon Steel Surface Before Exposure to Corrosive Solvent



Carbon Steel Surface After Exposure to Corrosive Solvent

RIGOROUS EXPERIMENTAL TESTING OF CORROSION RATES

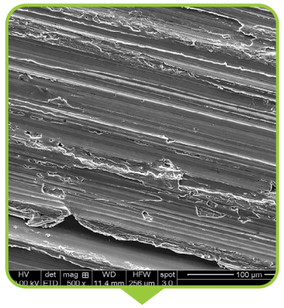
Cross-section of steels, solvents, and operating conditions investigated

- NETL/RIC research facilities are used to synthesize and test hydrophobic solvents in specialized Parr reactors.
- Corrosion rates of both carbon and stainless steel exposed to eight different solvents and aqueous solutions were measured under a range of temperatures, pressures, and gas compositions.
- The amount of corrosion is determined by measuring both the formation of nodules on the steel surface and the concentration of free metal ions released into the solvent.
- Long-term experimental testing, spanning one-to-four weeks, gives results that more accurately represent the projected performance of the solvents.

Parr Reactors (Top) are Used to House Steel Samples in Solvents for a Period of Time (A Low Corrosion Rate Results in a Clear Solvent [Bottom Left], While a High Corrosion Rate Imparts a Yellow Hue to the Solvent [Bottom Right])

NETL-DEVELOPED SOLVENT SHOWS UNPRECEDENTED CORROSION RESISTANCE

CASSH-1 shows notable capture performance.



Steel Surface After Exposure to Non-Corrosive Cassh-1 Solvent

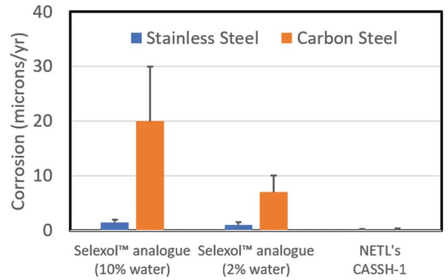
- Computational simulations (with OLI Studio Software) for predicting corrosion rate and water and CO_2 uptake were used to downselect promising candidates.
- Testing of solvent capture properties showed that CASSH-1 outperforms commercially available solvents in terms of corrosion rates, vapor pressure, and absorption kinetics.
- Simulations were validated by corrosion testing of the **hydrophobic solvent, which caused no measurable corrosion with either carbon or stainless steel**.

HIGH POTENTIAL FOR IMPLEMENTATION OF SOLVENT WITH NEAR-ZERO STEEL CORROSION

This novel solvent can benefit capture processes even when used with cheaper carbon steel.

The hydrophobic CASSH-1 solvent demonstrates superior performance, with uptake capacities comparable to hydrophilic Selexol™ and similar selectivities for CO_2.

These results show a promising technology ideal for long-lasting compatibility with absorber equipment.



Corrosion Test Results Demonstrated a Notable Decrease in Corrosion Rates Compared to a Benchmark Capture Solvent

PARTNERS

EERC

OLI systems, inc.

AWARD NUMBER
FWP-1022402

PROJECT BUDGET

EY20 + EY21 FUNDING

$386K

DOE $386,000

CONTACTS

HQ PROGRAM MANAGER
LYNN BRICKETT

TECHNOLOGY MANAGER
DAN HANCU

FEDERAL PROJECT MANAGER
PARRISH GALUSKY

TECHNICAL PORTFOLIO LEAD
DAVID HOPKINSON

PRINCIPAL INVESTIGATOR
NICHOLAS SIEFERT

FECM RDD&D PRIORITY

DEMONSTRATE AND DEPLOY POINT-SOURCE CARBON CAPTURE

CLICK HERE FOR MORE INFORMATION