

AMPP: Association for Materials Protection & Performance

Brad Wilder, P.E. – Senior Director, Technical Advancement – August 2024

brad.wilder@ampp.org





Association for Materials Protection & Performance

Types of AMPP Standards



**STANDARD
PRACTICE
(SP)**



**TEST METHOD
(TM)**



**MATERIAL
REQUIREMENT
(MR)**



**GUIDES
(GUIDE)**



**TECHNICAL
REPORT
(TR)**

Standards Committee SC 26

Carbon Capture, Alternative Fuels, and Energy Storage

Develops and maintains standards, guides, and reports related to materials protection and performance in carbon capture, utilization, and storage and in alternative fuel and energy storage technologies including hydrogen, biofuels, non-fossil and low-carbon fuels, thermal and chemical energy storage, and related technologies.

Guideline for Materials Selection and Corrosion Control for CO₂ Transport and Injection

Foreword, Scope, Rationale	5
Referenced Standards and Other Consensus Documents	7
Materials Definitions	8
Introduction	9
CCS Process	11
Proposed Work Process	12
Identifying Operating Envelope	14
Materials Selection & Corrosion Management	16
Input for a Failure Mode and Effect Analysis	19
Corrosion in Dense Phase CO ₂	22
Corrosion Resistant Alloys	23
Non-Metallic Materials	26
Standards That Can Be Used for CCS Design	26
Suggested Base Case Materials Selection	28
Overview of CO ₂ Impurities and Their Potential Impact	29
Other Referenced Documents	29
Figures	9
Figure 1	Diagram Showing an Example of the CCS Process
Figure 2	Materials Selection and Corrosion Control Process (Note: Steps A, B, and C, Resulting in D Require Review during Each Project Phase (Assess, Select, Define, Execute) and Steps E, F, and G for Operate)
Figure 3	Indicative Phase Diagram for CO ₂ with 0.1 Mole % H ₂ O, Graph Based on Phase Behavior Modelling
Figure 4	Phase Diagram of Pure CO ₂ (left) and Depressurization Curve (right) for Pure CO ₂ , from Reference. The Arrows Point in the Direction of Blow Down and Indicate Especially at Atmospheric Conditions (Limited Heat Influx) that the Metal Temperature can go Down to the Sublimation Point and Requires an LDT of -80 °C
Figure 5	Sour Regions Conform to ANSI/NACE MR0175/ISO 15156; the Area Circled in Red is What can be Expected for CO ₂ Transport and is Currently a Not Defined Area for CS and LAS
Figure 6	Water Solubility Limits (ppmv) in CO ₂ as a Function of CO ₂ Pressure at Several Temperatures (Possible Hydrate Formation was Not Included in the Model)
Figure 7	Comparison of Calculated and Experimental Solubilities of Sulfuric Acid (Solid Lines, Solid Symbols) and Nitric Acid (Dashed Lines, Hollow Symbols) in CO ₂
Figure 8	CRA Materials with their Depassivation Limits in this Case, the Depassivation pH of Various Stainless Steels in NaCl 2 M (71 g/l Cl ⁻) De-Aerated and Acidified with HCl at 23 °C
Figure 9	Solubility Parameters for Liquid CO ₂ and Some Polymers at Room Temperature
Figure 10	An Example Generic Chemical Resistance List for Polymer Materials, Modified from Several Sources

AMPP Guide 21532: Guideline for Materials Selection and Corrosion Control for CO₂ Transport and Injection

- Discusses corrosion considerations for CCS projects
- Describes a work process for materials selection and corrosion control that can address the specific requirements of a CCS project

Standards in Development

- GUIDE 21577: Guideline for Laboratory Corrosion Testing for CO2 Transport and Injection
- SP 21632 Series: Standard Practice for Materials Selection and Corrosion Control for CCS Projects
 - 1) Failure Mode & Effect Analysis execution for CCS projects
 - 2) Specification/Composition
 - 3) Materials Selection and Testing for CO2 Injection in Wells
 - 4) Materials Selection and corrosion control for CO2 Transport



THANK YOU!

standards@ampp.org

www.ampp.org/standards