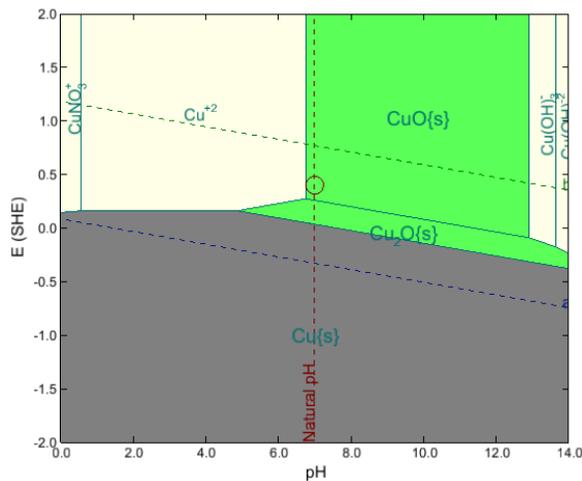# OLI Studio: Corrosion Analyzer

OLI Studio: Corrosion Analyzer™ is a first-principles corrosion prediction tool. It is used to predict the rates of general corrosion, propensity of alloys to undergo localized corrosion, depletion profiles of heat-treated alloys, and the thermodynamic stability of metals and alloys. It enables users to address the causes of aqueous corrosion by identifying its mechanistic reasons. As a result, users take informed action on how to mitigate or eliminate this risk.

Corrosion Analyzer calculates corrosion by quantifying the bulk chemistry, transport phenomena, and surface reactions through a thermophysical and electrochemical module.

The thermophysical module calculates the aqueous solution speciation and obtains concentrations, activities and transport properties of the reacting species.

The electrochemical module simulates partial oxidation and reduction processes on the metal surface.

The tool reproduces the active-passive transition and the effects of solution species on passivity. Effects of temperature, pressure, pH, concentration, and velocity on corrosion are included.

Thus, Corrosion Analyzer™, helps you determine the causes of corrosion before it occurs, and helps you evaluate and implement preventive actions, such as choosing the best operating conditions or selecting corrosion resistant materials.

Capabilities and Features

✓ **E-pH, Pourbaix diagrams**
Create E vs. pH diagram of target elements in single- or multi-phase environments. Calculate the stable and metastable corrosion products and redox couples. Test the effects of temperature and pressure on redox thermodynamics, and the concentration effects on species activity. Analyze specific compositions for carbon steels, stainless steels, Ni-base and Cu-Ni alloys.

✓ **E-species, Stability diagrams**
Create E vs. species diagrams of target elements or alloys, where the independent variable is a species concentration that impacts the redox or speciation behavior of the element

✓ **General corrosion rates plots**
Calculate the rate of general corrosion and the corrosion potential for a large and growing list of materials in contact with aqueous solutions. .

✓ **Localized corrosion**
To predict whether the alloy is susceptible to localized corrosion, compare the calculated repassivation and corrosion potentials. If localized corrosion is possible, calculate the maximum propagation rate.

✓ **Heat treatment effects**
Depletion of Cr, Mo, and W in grain boundaries as a result of heat treatment is predicted for stainless steels and Ni-base alloys, thus making it possible to evaluate intergranular corrosion and the effect of heat treatment on localized corrosion.

✓ **Polarization Plots**
The anodic and cathodic partial reactions involved in corrosion are plotted on software-generated polarization curves. The processes that contribute to the mixed potential and corrosion current density can be identified.
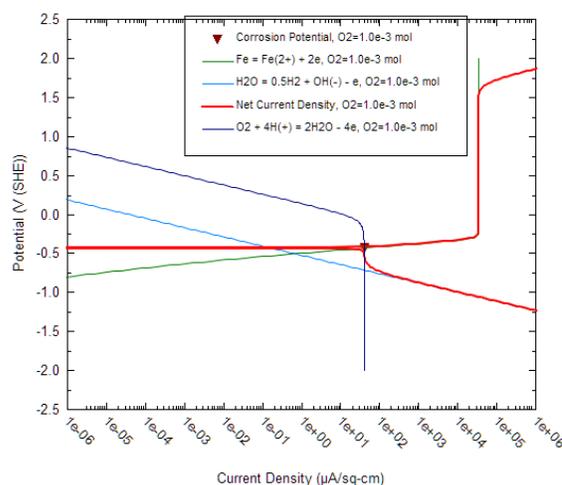
OLI Studio: Corrosion Analyzer

✓ **Automatic inclusion of redox** — Half-reactions for elements, alloy components and solution species are automatically included in a corrosion calculation.

✓ **Kinetic parameters of corrosion** — Electrochemical parameters, including Tafel slope and intrinsic exchange current density calibrated against literature data

✓ **Transport properties** — Rigorous transport property prediction, including diffusion, electrical conductivity, and viscosity – all needed for predicting corrosion

✓ **Real-solution calculations** — Non-ideal, activity coefficient predictions for complex, high ionic strength systems. This produces more realistic stability diagrams

Applications

✓ Screening to focus lab and plant tests
✓ "Hot spots" for sensor locations
✓ Useful remaining service life
✓ Process changes and corrective action testing
✓ Lab and plant screening sensitivity studies
✓ pH, composition, and temperature effects
✓ Failure diagnosis and avoidance

Supported Alloys

- Iron and carbon steel
- Stainless steels: 13Cr, 304, 316, 254SMO
- Nickel-base alloys: C-22, C-276, 600, 625, 690, 800, and 825
- Duplex alloy: 2205
- Copper-nickel alloys: CuNi9010, CuNi7030
- Aluminum, nickel, copper

Now shipping OLI Studio V9

Corrosion Analyzer work with Stream Analyzer and ScaleChem within the OLI Studio software suite.

OLI Studio: Stream Analyzer — for in-depth chemistry studies of your electrolyte chemistry
OLI Studio: Corrosion Analyzer — for the electrochemistry of aqueous corrosion
OLI Studio: ScaleChem — in-depth chemistry studies for oilfield applications