New chemistries	Verticals						Applications
	Upstream O&G	Downstream O&G	Metals & Mining	Water Treatment	Power Gen	Chemicals	
Carbon transportation chemistry: • Mixtures of CO, N_2, H_2, O_2, Ar and light hydrocarbons (C1-C6) with CO_2, water, sulfuric acid and nitric acid	✔	✔	✔		✔		• Transportation of CO_2 with significant concentrations of other light cases including CO, N_2, H_2, O_2, Ar and light hydrocarbons (using the MSE model) • Autoclave experiment design for corrosion studies (using the MSE-SRK model)
• Solid phases of sulfuric acid and nitric acid	✔	✔	✔		✔		• Transportation of chilled CO_2 on ships • Desiccants, catalysts in chemical industry; aerosols
Upstream oil and gas chemistry: • Monoethylene glycol (MEG) interactions with H_2, CO, and Ar	✔						• Dehydration of natural gas, hydrate and corrosion inhibition
Refinery chemistry: • Thiosulfuric acid ($H_2S_2O_3$)		✔				✔	• Corrosion in refining
• Calcium malate		✔				✔	• Prevention of calcium malate deposits for asset integrity
• Additional hydrocarbons: 1,2 and 1,3-butadiene, 1,2,4-trimethylbenzene and 1-octene		✔					• Refinery modeling – including hydrocarbons that were missing in MSE
Geothermal chemistry • Antimony sulfide in water and brines					✔		• Antimony sulfide mineral scaling in geothermal energy production
Critical materials: • Cobalt minerals			✔				• Cobalt mining and leaching, cobalt ore properties
• Cadmium telluride and cadmium sulfide			✔		✔		• Recycling and processing of materials for solar panels
• Sodium neodymium fluoride			✔				• Fluorescent materials
• Rare earth complexation with EDTA			✔				• Separation of rare earths from ores and recycled materials
• Neodymium nitrate with nitric acid			✔				• Separation of rare earths from ores and recycled materials
• Solvent extraction of neodymium from nitrate solutions using TODGA (tetraoctyl diglycolamide)			✔				• Separation of rare earths using solvent extraction
• Revision of cobalt and nickel solvent extraction equilibria			✔				• Production and recycling of cobalt and nickel
• Revision of alkaline systems containing lithium and calcium			✔				• Lithium production from brines
Nuclear waste and wastewater chemistry: • Rubidium and cesium sulfate					✔	✔	• Processing and disposal of nuclear wastes including minor radioactive components • Catalytic components in chemical industry
• Mercury salts: mercurous formate, glycolate and oxalate, mercuric nitrate, formate, glycolate and oxalate				✔	✔		• Processing and disposal of nuclear waste • Wastewater treatment
• Organic mercury compounds: dimethylmercury, methylmercury hydroxide and nitrate		✔		✔	✔		• Processing and disposal of nuclear waste • Mercury as an impurity in refining • Wastewater treatment

Corrosion rates and localized corrosion prediction	Verticals						Applications
	Upstream O&G	Downstream O&G	Metals & Mining	Water Treatment	Power Gen	Chemicals	
New alloys in MSE Corrosion: • Martensitic stainless steels: S13Cr, S15Cr, and S17Cr • Austenitic stainless steel: 316 • Nickel-base alloy: 625 **Improved alloys in MSE Corrosion:** • Duplex alloys: 2507, 2205	✔	✔	✔	✔	✔	✔	Cross-cutting: Expanding MSE Corrosion from 2 to 7 alloys
Improved predictions in AQ Corrosion: • Corrosion-resistant alloys in the presence of fluorides • Repassivation potential of martensitic alloys • Revision of the effect of oxygen on localized corrosion	✔	✔	✔	✔	✔	✔	Cross-cutting