

# Method and Materials for Corrosion Resistance in High-Temperature, High- Pressure Energy and Chemical Systems

**Novel solid and fluid materials dramatically lower oxidation rates, endowing metals and ceramics with enhanced corrosion resistance for use in high-temperature, high-pressure industrial environments.**

Among the numerous heat and mass transfer systems, there exists a need for corrosion-resistant materials for use in high temperature, high pressure, corrosive fluid environments. Such systems include, but are not limited to, electric power production, including solar energy-based power production, nuclear energy-based power production, fossil fuel-based power production; waste heat recovery; transportation/propulsion; and chemical processing. These systems require components suitable for use in high temperature, high-pressure environments, such as heat exchangers, piping, valves, pumps, engine components, etc. Unfortunately, embodiments of these corrosion resistant components lack in versatility and durability. More effective methods and materials are necessary.

A Purdue University researcher has identified solid and fluid materials capable of endowing metals, metallic alloys, ceramics, and ceramic composites with resistance to corrosion in high-temperature, high-pressure, corrosive fluid environments, where the fluid includes a gas, a liquid, or a supercritical fluid, or a mixture of these fluids. Materials have been developed to enable dramatically lower rates of oxidation, resulting in corrosion-resistant materials.

## **Advantages:**

- Corrosion-resistant materials
- Enhanced use of high temperature and high pressure environments

Potential Applications:

## **Technology ID**

2016-SAND-67546

## **Category**

Energy & Power Systems/Power  
Generation  
Materials Science &  
Nanotechnology/Advanced  
Functional Materials

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-Systems for energy production, waste heat recovery, transportation/propulsion, and chemical processing

**TRL:** 6

**Intellectual Property:**

Provisional-Patent, 2016-10-18, United States | PCT-Patent, 2017-10-11, WO  
| NATL-Patent, 2019-04-17, United States | PCT-Patent, N/A, WO

**Keywords:** Corrosion-resistant materials, high temperature, high pressure, corrosive fluid environments, heat exchangers, metallic alloys, ceramics, ceramic composites, oxidation resistance, energy production