

High Temperature Stainless Steel Alloy with Low Cost Manganese

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Technology Summary

A new stainless steel alloy for very high heat industrial applications was developed by ORNL researchers. This invention successfully substitutes lower cost manganese for nickel to give stability. The alloy is an austenite, a phase of iron made by heating iron until its crystal structure changes and offers better, tougher mechanical properties. High manganese austenitic stainless steel is a valuable structural alloy for power generation systems, nuclear fusion research, and automotive and aerospace applications.

Manganese is approximately 18 times less expensive than nickel. Like nickel, it is effective for stabilizing the austenite structure of an iron alloy. To date, attempts to substitute manganese have produced austenitic stainless steels with desirable properties at either room temperature or cryogenic temperatures, but not at the high temperatures required in power generation systems or in nuclear fusion. The ORNL invention can withstand temperatures of 650 to 800°C.

Advantages

- Corrosion resistant
- Withstands temperatures of 650 to 800°C.
- Less costly than using nickel for stability

Potential Applications

- Power generation plants
- Power industry components such as boiler tubing and piping, pressure vessels, chemical reactor vessels, turbine casings, and turbine rotors
- Transportation systems
- Nuclear fusion research
- Surgical instruments
- Automotive and aerospace assembly

Patent

Yukinori Yamamoto, Michael L. Santella, Michael P. Brady, Philip J. Maziasz, and Chain-tsun Liu, *High Mn Austenitic Stainless Steel*, U.S. Patent 7,754,305, issued July 13, 2010.

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