Ceramic Pump and Valve for Liquid Metals (#7284)

A ceramic pump and valve that allows the use of liquid metals at extreme temperatures

Georgia Tech researchers have created a new ceramic pump and valve system capable of circulating liquid metal at extreme temperatures. With a key innovation in its sealing approach, this technology is first of its kind and opens up many new uses for liquid metals, particularly in regards to the energy sector.

Benefits/Advantages

- First of its kind
- Set the world record for the hottest fluid ever pumped continuously
- Opens up new industry applications

Potential Commercial Applications

- High temperature concentrated solar power
- High temperature thermal energy storage of electricity (grid storage)
- Solar thermophotovoltaics with storage
- Methane cracking for hydrogen production
- Friction stir welding
- Hypersonics
- Turbine blade cooling

Background/Context for This Invention

Applications that involve high temperatures have always relied on gas based heat transfer and radiation, which are inherently power dense and geometrically limited. There are a wide variety of high temperature applications that would benefit from moving heat around more effectively through a liquid at extreme temperatures, above 1000 Celsius. While liquid metals have chemical stability at such extreme temperatures, they have been hampered by the inability to handle them under such extreme conditions, where it will quickly corrode or degrade virtually any metal containment material it contacts.

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More Information

Publications

Ceramic Pump Moves Molten Metal at a Record 1,400 Degrees Celsius, Georgia Tech News Center, Oct 11, 2017

For more information about this technology, please visit:
https://licensing.research.gatech.edu/technology/ceramic-pump-and-valve-liquid-metals

Images:

The automated sequential delivery of multiple fluids. A varying number of delay gates imprinted in the branches are shown in the figure.

COVID-19 and flu saliva test on paper: (A) The automatic sequential delivery of multiple reagents required for virus test; (B) Water pouring into the device triggers the virus assay, allowing the presence of SARS-CoV-2 and influenza A & B viruses to be visually identified by the color changes in the corresponding detection spot