PURDUE INNOVATES | Office of Technology Commercialization

Refractory Plasmonic Nanofurnaces for Chemistry and Solar-thermal Devices

Scalable films convert sunlight to heat with near-unity absorption and stability near 600 °C for solar-thermal and chemical processes.

Heat generation and management are among the most critical issues on a global scale. However, solar-thermal heat generation only accounts for a small portion of renewable heat generation, highlighting the need for the development of more efficient, large-scale, solar-to-heat energy conversion technologies. Researchers at Purdue University have developed refractory thermoplasmonic nanofurnace films capable of reaching high temperatures under solar irradiation. Whereas many current solutions have low stability at high temperatures or are not easily scalable, this technology has been shown to be stable up to around 600C while being fabricated on a square centimeter scale and have a solar-to-heat conversion efficiency of approximately 68 percent. Furthermore, this technologies well-defined geometric arrangements of metal and dielectric nanostructures may provide designed metamaterials with near-unity absorption of light within a broad or limited spectral range. This large-scale, efficient refractory thermoplasmonic nanofurnace film can be utilized in solar energy conversion or chemical processes.

Advantages:

-Large-scale

-High temperature stable

-Near-unity absorption

Potential Applications:

-Refractory thermoplasmonic nanofurnace films

-Solar energy conversion

-Chemical processes

TRL: 2

Technology ID

2019-SHAL-68606

Category

Semiconductors/Packaging & Integration

Energy & Power Systems/Power Generation

Materials Science & Nanotechnology/Nanomaterials & Nanostructures

Further information

Will Buchanan

wdbuchanan@prf.org

View online

Intellectual Property:

Provisional-Patent, 2019-05-03, United States

Utility-Gov. Funding, 2020-05-03, United States

PCT-Gov. Funding, 2020-05-04, WO

DIV-Patent, 2022-05-02, United States

Keywords: Chemical Engineering, Green Technology, Solar Technology