

Accepted Manuscript

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PII: S0042-207X(17)30562-6

DOI: [10.1016/j.vacuum.2017.09.051](https://doi.org/10.1016/j.vacuum.2017.09.051)

Reference: VAC 7627

To appear in: *Vacuum*

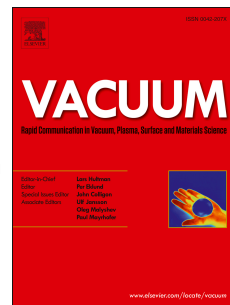
Received Date: 7 May 2017

Revised Date: 29 September 2017

Accepted Date: 30 September 2017

Please cite this article as: Hu E-T, Guo S, Gu T, Zang K-Y, Tu H-T, Cai Q-Y, Yu K-H, Wei W, Zheng Y-X, Wang S-Y, Zhang R-J, Lee Y-P, Chen L-Y, High efficient and wide-angle solar absorption with a multilayered metal-dielectric film structure, *Vacuum* (2017), doi: 10.1016/j.vacuum.2017.09.051.

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High efficient and wide-angle solar absorption with a multilayered metal-dielectric film structure

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Abstract

A typical 6-layered metal-dielectric film structure of SiO₂ (57.3 nm)/Cr (2.9 nm)/SiO₂ (72.9 nm)/Cr (6.6 nm)/SiO₂ (57.6 nm)/Cu (>100.0 nm) was designed and fabricated by magnetron sputtering. It showed a high solar absorption of about 95.8% in the wavelength range of 250-2000 nm, a low thermal emittance of about 0.104 at 600 K and good thermal stability at 673 K after annealing for 12 hours in vacuum condition. The angle-dependent reflectance spectra indicated that the proposed 6-layered film structure has a great angular tolerance even when the incident angle increases to 50°. All of the excellent spectral properties and good thermal stability demonstrate the 6-layered planar film structure will be suitable for practical applications of solar-thermal conversion.

Keywords: metal-dielectric film structure, solar absorption, thermal emittance, solar-thermal conversion.

1. Introduction

As one of the most prevalent technologies for high efficient solar energy utilization, extensive attention has been paid to solar-thermal conversion in the past decades [1, 2] with practical applications such as solar-heating, solar-thermal-electricity,

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