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Supplementary Information

Silver alloy based metal matrix composites: A potential material for highly reliable transparent thin film heater

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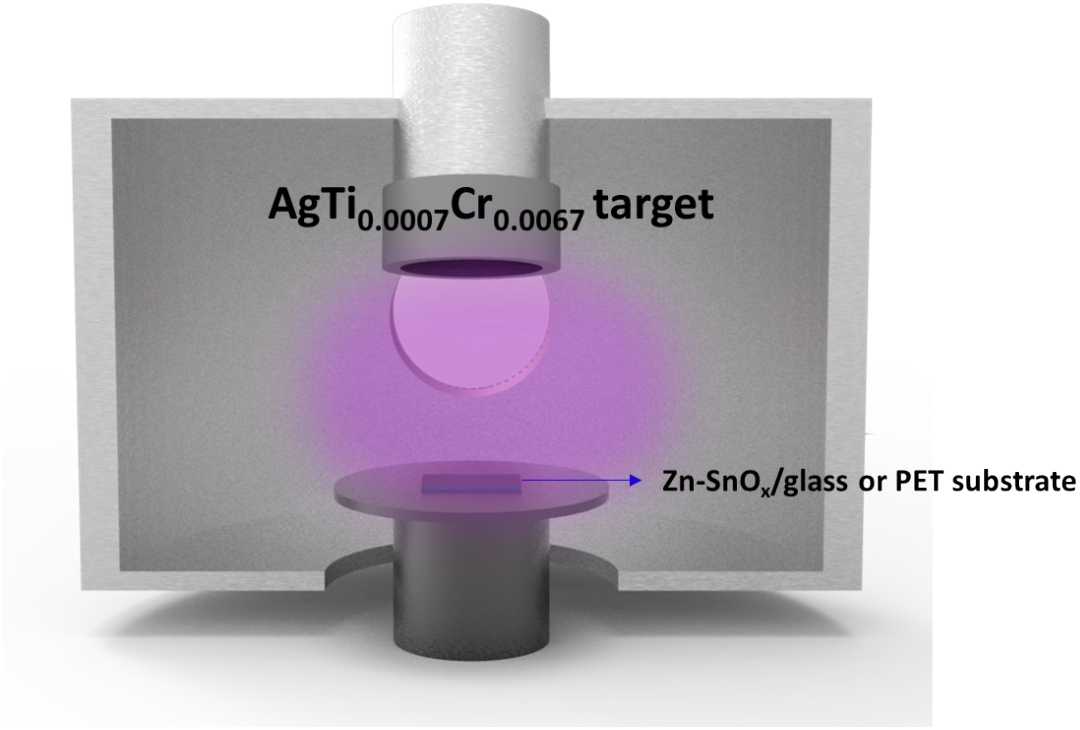

Fig. S1. Schematic of the on-axis RF sputtering system.

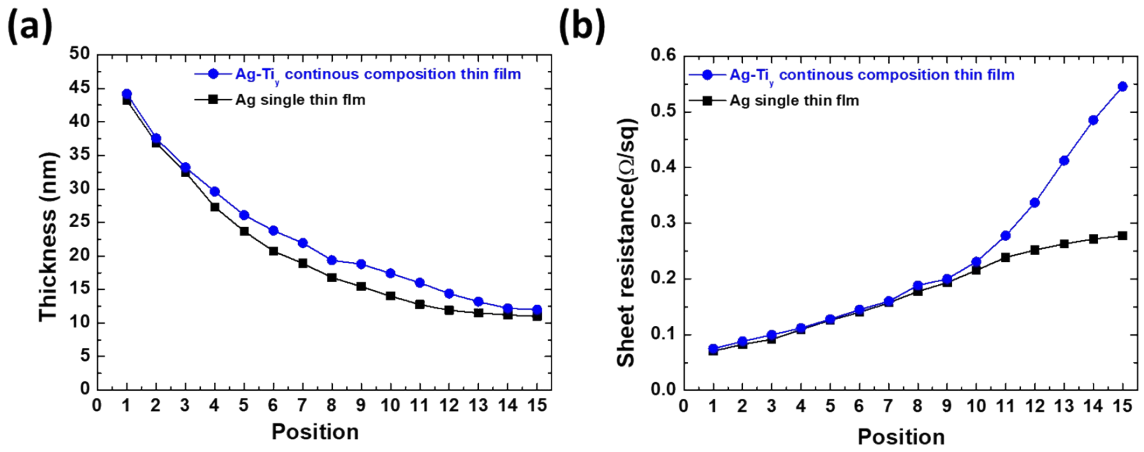

Fig. S2. (a) Thickness and (b) the sheet resistance of Ag single thin film and Ag-Ti_y continuous composition thin film deposited by CCS method.

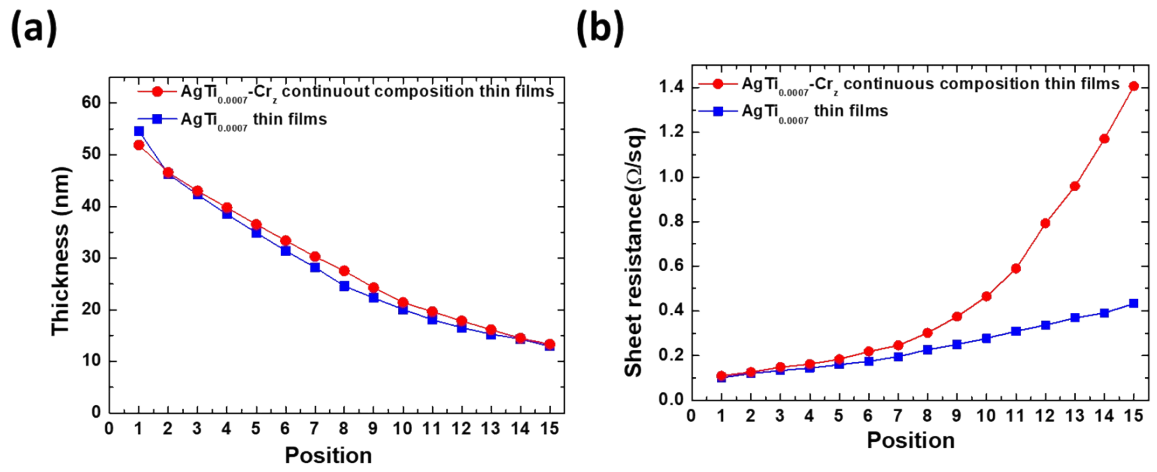

Fig. S3 (a) Thickness and (b) sheet resistance of $AgTi_{0.0007}$ single thin film and $AgTi_{0.0007}$-Cr_z continuous composition thin films deposited by CCS method.

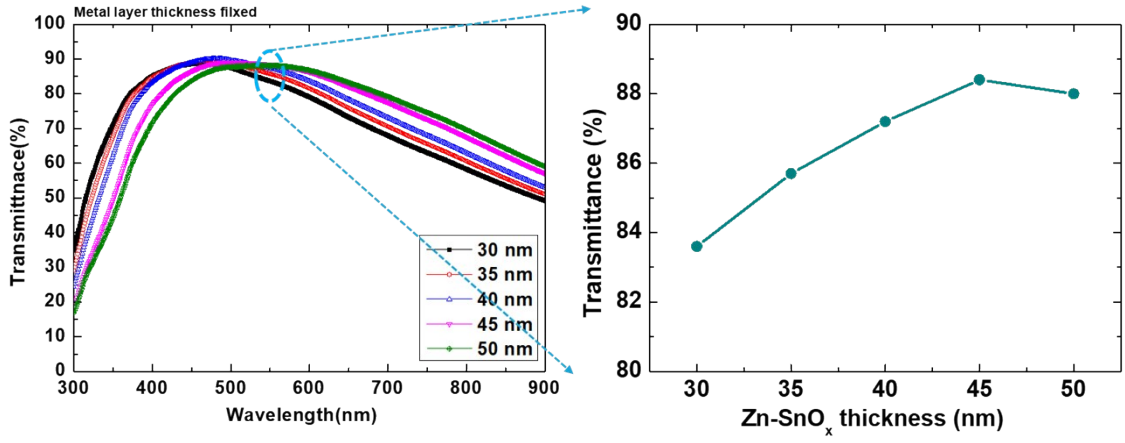

Fig. S4 The optical simulation data of Zn-SnO_x/ATC/Zn-SnO_x multilayers when the thickness of metal layer was fixed as 10 nm.

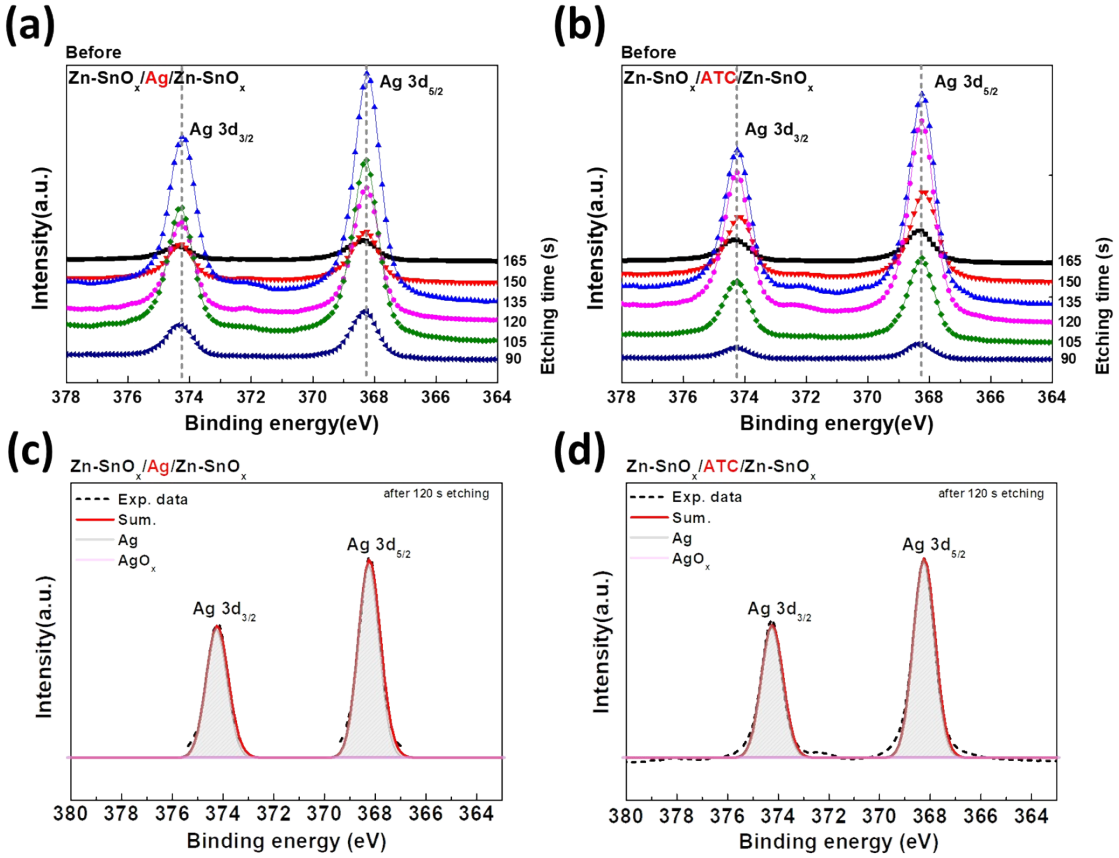

Fig. S5 XPS depth profiling analysis of the Ag 3d peaks of (a) Zn-SnO_x/Ag/Zn-SnO_x multilayer and of (b) Zn-SnO_x/ATC/Zn-SnO_x multilayer before the constant temperature–humidity test. XPS spectra of the Ag 3d binding energy of the interface of (c) Ag/ZTO (d) ATC/ZTO at Ar^+ etching time of 120 s

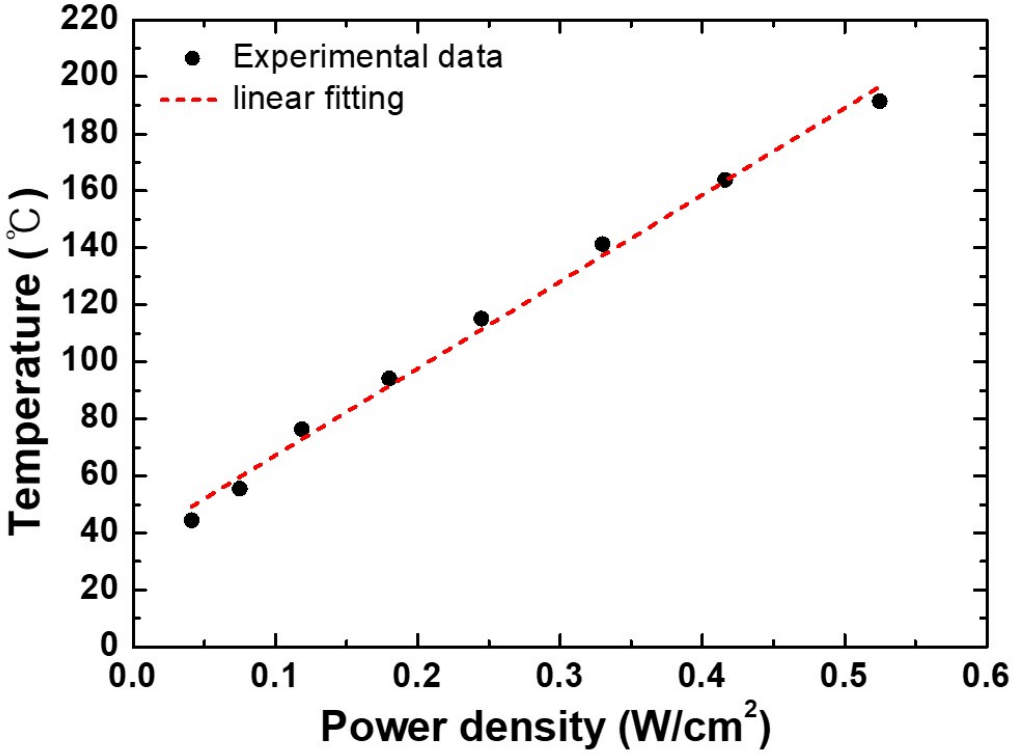

Fig. S6. The temperature of the Zn-SnO_x/ATC/Zn-SnO_x multilayer thin film defroster as a function of supplied power.

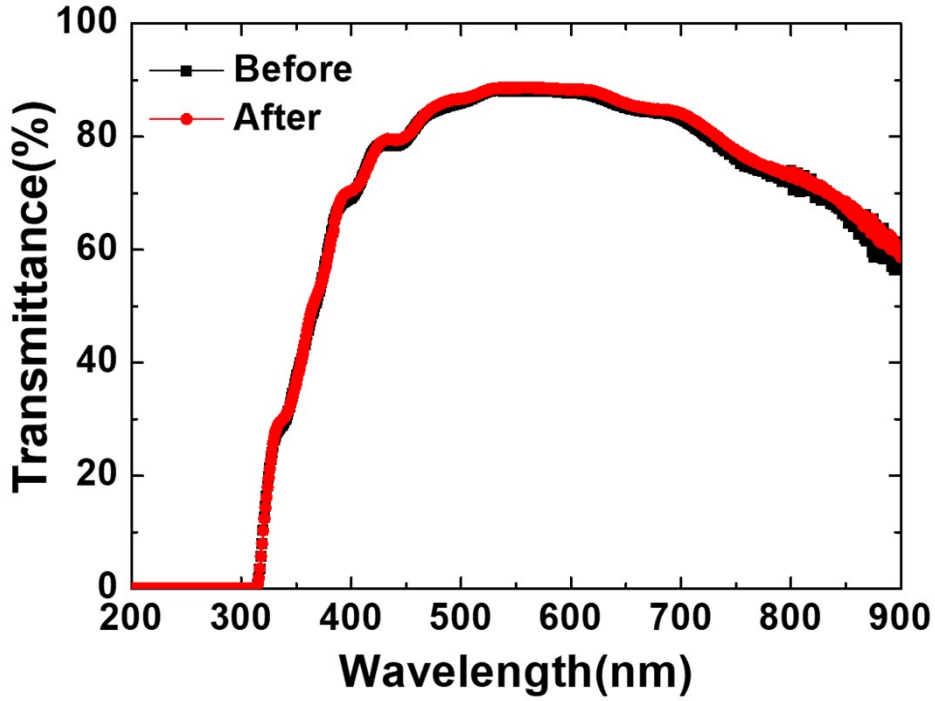

Fig. S7. The temperature of the Zn-SnO_x/ATC/Zn-SnO_x multilayer thin film defroster as a function of supplied power.

Table S1. Comparison of power efficiency, reliable heat-cooling cycle, and transmittance of reported transparent defroster.

Materials	Power efficiency (℃ cm^2/W)	Reliable heating-cooling cycle	Transmittance (%, at 550 nm)	Ref.
ITO	88	-	-	[1]
FTO	119	-	-	
Ag nanowire(AgNW)	160	20	58	[2]
AgNW/PEDOT:PSS	179	50	83	[1]
Ag wire mesh	255	5	77	[3]
Cu/Ni nano-network	421	20	71	[4]
ZTO/Ag/ZTO multilayer	322	100	86	Previous work[5]
ZTO/ATC/ZTO multilayer	305	200	89	This work

Reference

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