<u>Supplementary Material</u>

Comparison of the optical properties of different dielectric materials (SnO_2, ZnO, AZO, or $SiAlN_x$) used in silver-based low-emissivity coatings

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Abbreviation	Meaning
AZO	Aluminum-doped zinc oxide
ITO	Indium tin oxide
TiAlN	Aluminum-doped titanium nitride
PVD	Physical vapor deposition
IGU	Insulating glass units
MFC	Mass flow controller
DC	Direct current
sccm	Standard cubic centimeters per minute
AZO_2	AZO deposited under argon and a small amount of O_2
FE-SEM	Field emission scanning electron microscopy
UV-Vis/NIR	Ultraviolet, visible, and near infrared radiation
T_{VIS}	Transmittance factor in the visible range
T_{SOLAR}	Transmittance factor in the solar range
DIN EN	German Institute for Standardization—European Standard

Table S1: Abbreviations that appear in the manuscript with their meaning.

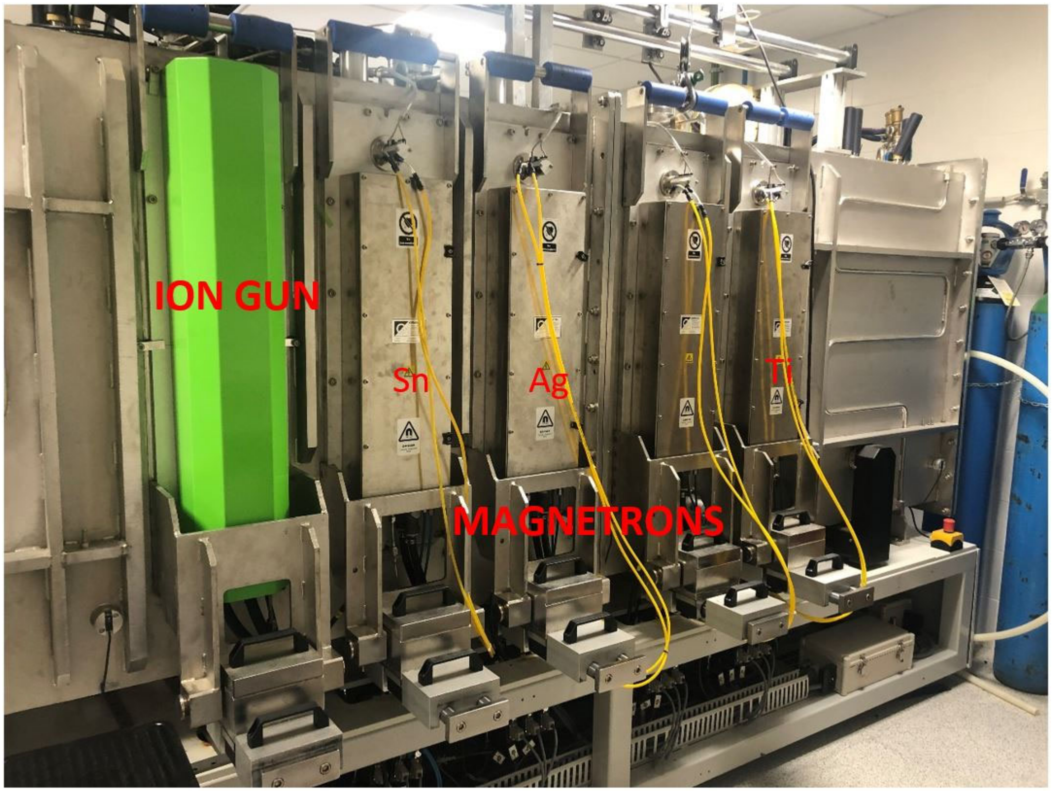

Figure S1a: Photograph of the process chamber showing the ion gun and magnetrons.

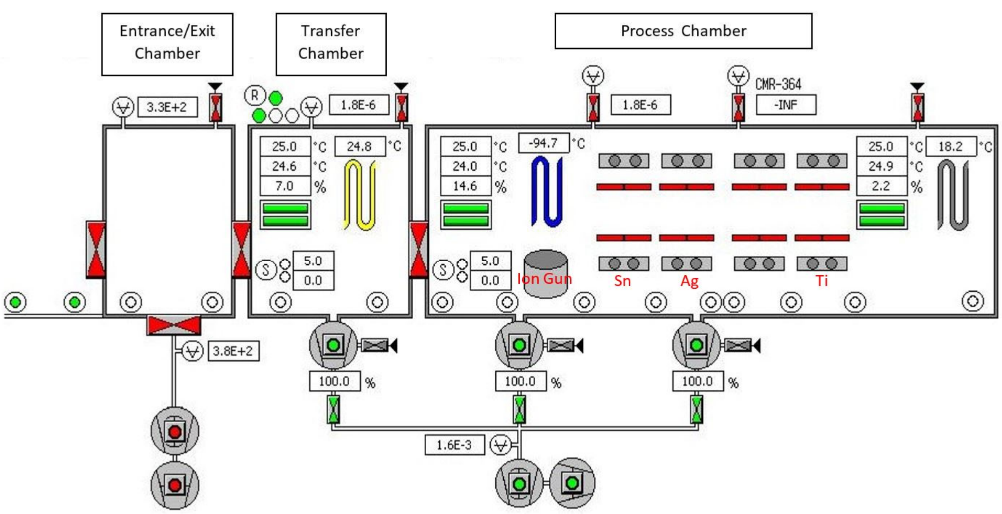

Figure S1b: Scheme of the deposition system.

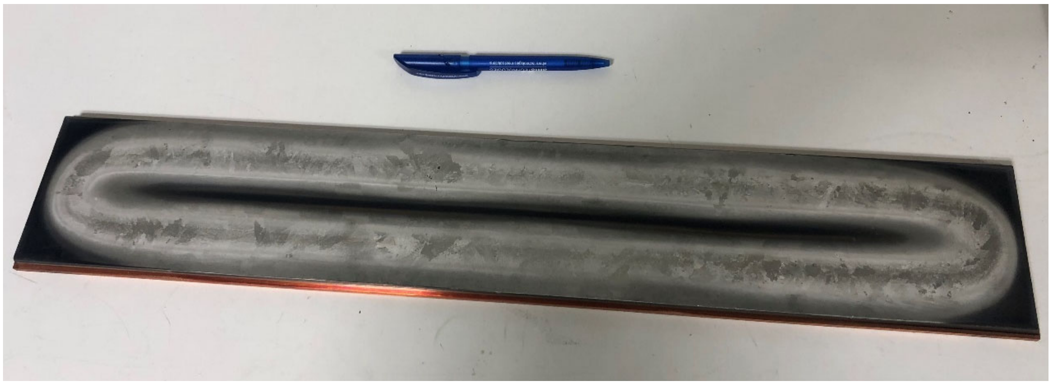

Figure S2: Sn target.

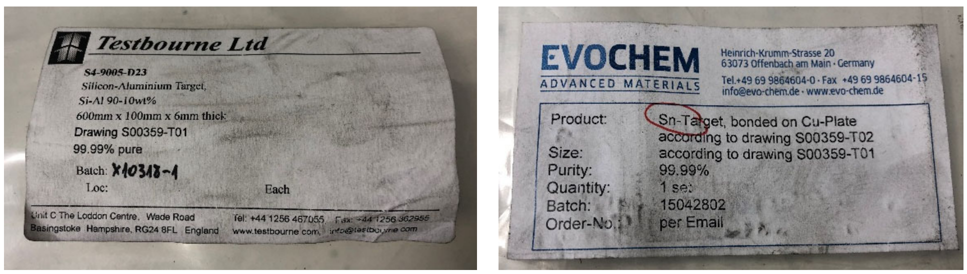

Figure S3: Photographs of the labels of two of the targets.

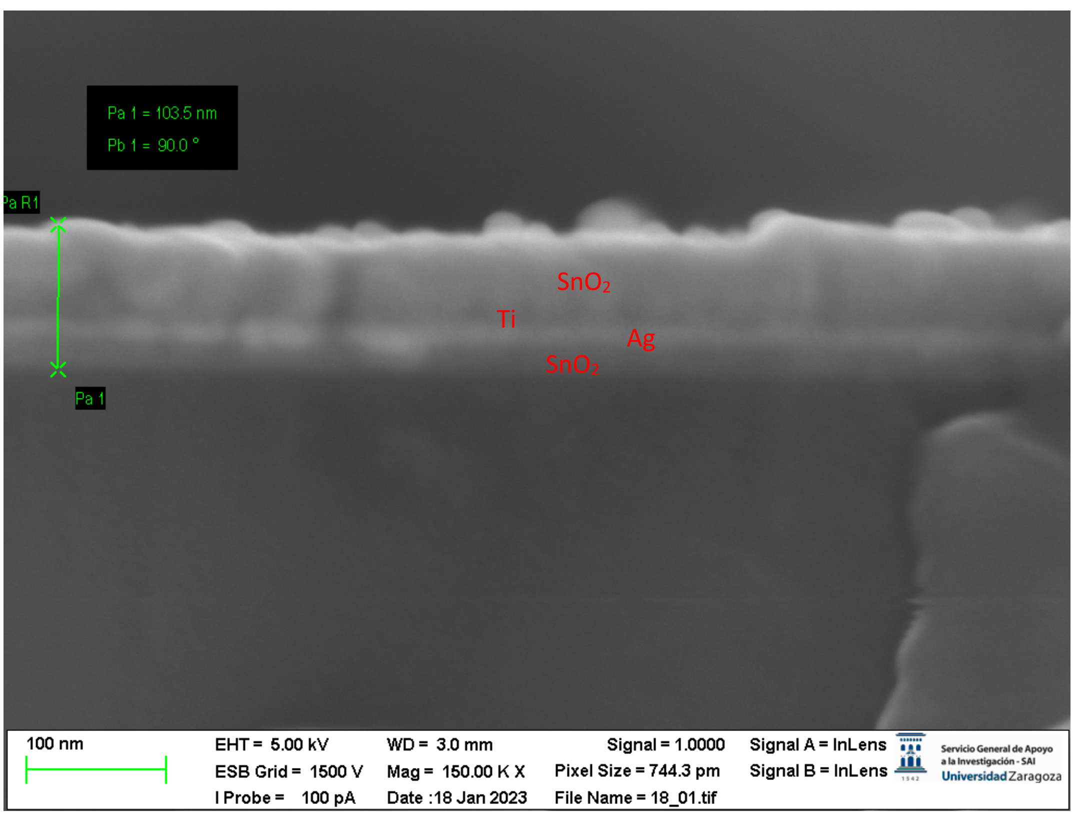

Figure S4: Cross-section of Sample S1.B (coating completed) performed by FE-SEM.

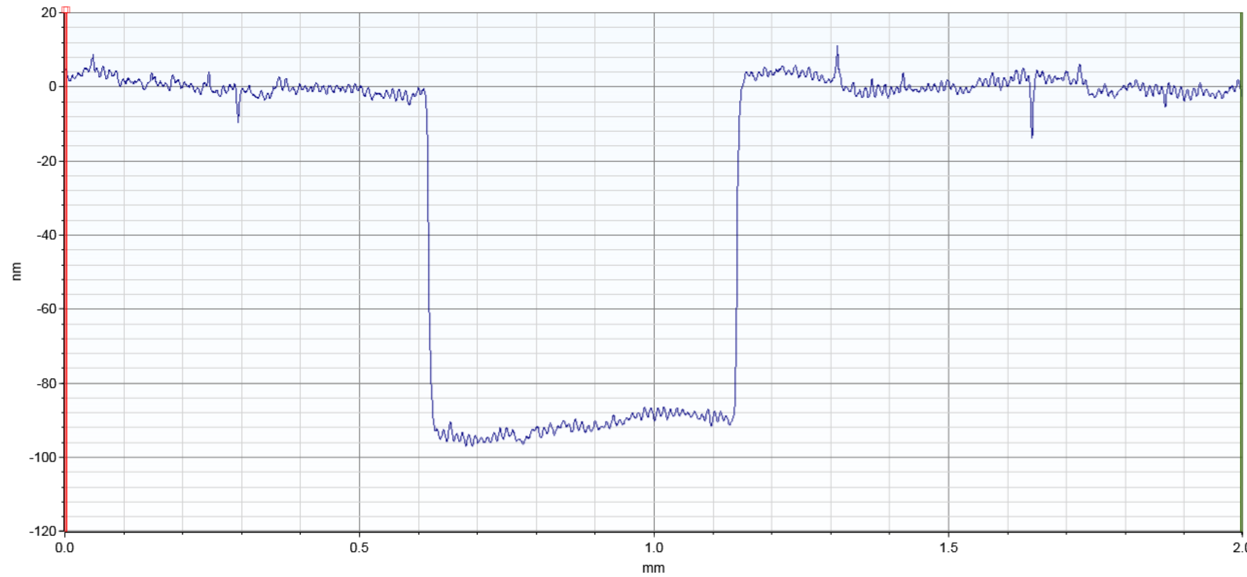

Figure S5: Profile of a single 92 nm SnO_2 layer.

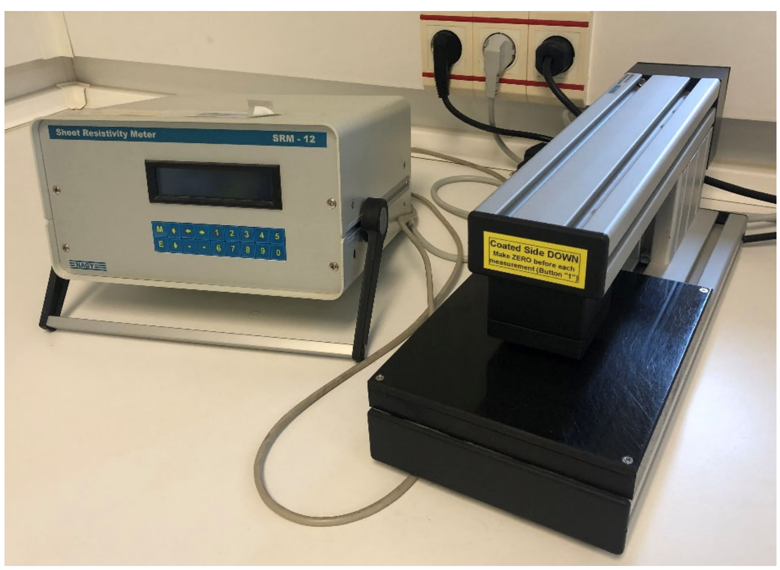

Figure S6: Photograph of the NAGY SRM-12 instrument for the measurement of sheet resistance.

Sample	Structure	Ag (nm)	$R_{\square}$ ($\Omega/\square$)	ε	Tvis
S1.A	Glass/SnO_2/Ag/Ti/SnO_2	10	7.83	0.083	0.819
S2.A	Glass/ZnO/Ag/Ti/ZnO	10	6.04	0.064	0.866
S3.A	Glass/AZO/Ag/Ti/AZO	10	5.47	0.058	0.868
S4.A	Glass/AZO_2/Ag/Ti/AZO_2	10	5.94	0.063	0.859
S5.A	Glass/$SiAlN_x$/Ag/Ti/$SiAlN_x$	10	6.32	0.067	0.861
S6.A	Glass/AZO/Ag/Ti/$SiAlN_x$	10	5.00	0.053	0.854
S7.A	Glass/$SiAlN_x$/AZO/Ag/Ti/$SiAlN_x$	10	5.57	0.059	0.848
S8.A	Glass/AZO/$SiAlN_x$/Ag/Ti/$SiAlN_x$	10	6.60	0.070	0.844
S9.A	Glass/$SiAlN_x$/AZO/Ag/Ti/$SiAlN_x$	10	6.13	0.065	0.847
S10.A	Glass/AZO/Ion/Ag/Ti/$SiAlN_x$	10	4.91	0.052	0.843
S11.A	Glass/$SiAlN_x$/Ion/Ag/Ti/$SiAlN_x$	10	5.94	0.063	0.837
S12.A	Glass/$SiAlN_x$/AZO/Ion/Ag/Ti/$SiAlN_x$	10	5.47	0.058	0.831

Table S2a: Properties of simple Ag samples with 10 nm Ag.

Sample	Structure	Ag (nm)	$R_{\square}$ ($\Omega/\square$)	ε	Tvis
S1.B	Glass/SnO_2/Ag/Ti/SnO_2	15	3.77	0.040	0.699
S2.B	Glass/ZnO/Ag/Ti/ZnO	15	2.92	0.031	0.750
S3.B	Glass/AZO/Ag/Ti/AZO	15	2.83	0.030	0.732
S4.B	Glass/AZO_2/Ag/Ti/AZO_2	15	2.92	0.031	0.749
S5.B	Glass/$SiAlN_x$/Ag/Ti/$SiAlN_x$	15	3.30	0.035	0.692

Table S2b: Properties of simple Ag samples with 15 nm Ag.

Sample	Structure	Ag (nm)	$R_{\square}$ ($\Omega/\square$)	ε	Tvis
S1.C	Glass/SnO_2/Ag/Ti/SnO_2	21	2.36	0.025	0.551
S2.C	Glass/ZnO/Ag/Ti/ZnO	21	1.89	0.020	0.606
S3.C	Glass/AZO/Ag/Ti/AZO	21	1.79	0.019	0.561
S4.C	Glass/AZO_2/Ag/Ti/AZO_2	21	1.89	0.020	0.602
S5.C	Glass/$SiAlN_x$/Ag/Ti/$SiAlN_x$	21	2.17	0.023	0.527
S6.C	Glass/AZO/Ag/Ti/$SiAlN_x$	21	1.70	0.018	0.524
S7.C	Glass/$SiAlN_x$/AZO/Ag/Ti/$SiAlN_x$	21	1.89	0.020	0.528
S8.C	Glass/AZO/$SiAlN_x$/Ag/Ti/$SiAlN_x$	21	2.17	0.023	0.518
S9.C	Glass/$SiAlN_x$/AZO/Ag/Ti/$SiAlN_x$	21	2.08	0.022	0.516
S10.C	Glass/AZO/Ion/Ag/Ti/$SiAlN_x$	21	1.70	0.018	0.507
S11.C	Glass/$SiAlN_x$/Ion/Ag/Ti/$SiAlN_x$	21	1.98	0.021	0.498
S12.C	Glass/$SiAlN_x$/AZO/Ion/Ag/Ti/$SiAlN_x$	21	1.89	0.020	0.510

Table S2c: Properties of simple Ag samples with 21 nm Ag.

Sample	Structure	Ag (nm)	R□ (Ω/□)	ε	Tvis
D1.A	Glass/SnO_2/Ag/Ti/SnO_2/Ag/Ti/SnO_2	24	2.92	0.031	0.718
D2.A	Glass/ZnO/Ag/Ti/ZnO/Ag/Ti/ZnO	24	2.17	0.023	0.731
D3.A	Glass/AZO/Ag/Ti/AZO/Ag/Ti/AZO	24	2.26	0.024	0.750
D4.A	Glass/AZO_2/Ag/Ti/AZO_2/Ag/Ti/AZO_2	24	2.17	0.023	0.727
D5.A	Glass/$SiAlN_x$/Ag/Ti/$SiAlN_x$/Ag/Ti/$SiAlN_x$	24	2.36	0.025	0.788

Table S3a: Properties of double-Ag samples with 24 nm Ag.

Sample	Structure	Ag (nm)	R□ (Ω/□)	ε	Tvis
D1.B	Glass/SnO_2/Ag/Ti/SnO_2/Ag/Ti/SnO_2	26	2.64	0.028	0.557
D2.B	Glass/ZnO/Ag/Ti/ZnO/Ag/Ti/ZnO	26	1.89	0.020	0.538
D3.B	Glass/AZO/Ag/Ti/AZO/Ag/Ti/AZO	26	1.98	0.021	0.568
D4.B	Glass/AZO_2/Ag/Ti/AZO_2/Ag/Ti/AZO_2	26	1.89	0.020	0.521
D5.B	Glass/$SiAlN_x$/Ag/Ti/$SiAlN_x$/Ag/Ti/$SiAlN_x$	26	2.17	0.023	0.545

Table S3b: Properties of double-Ag samples with 26 nm Ag.

Conclusion Highlights:

1.- AZO dielectric layers contribute to better emissivities.

2.- Greater thickness of AZO in the layer on which Ag is deposited results in improved emissivity.

3.- Etching the dielectric layer on which Ag is deposited with an ion gun enhances emissivity.

4.- Visible transmission is higher in structures with oxides dielectrics.