Highly Reflective Eco-Friendly NIR Cool Pigments: Properties and Energy-Saving in Reflective Cooling

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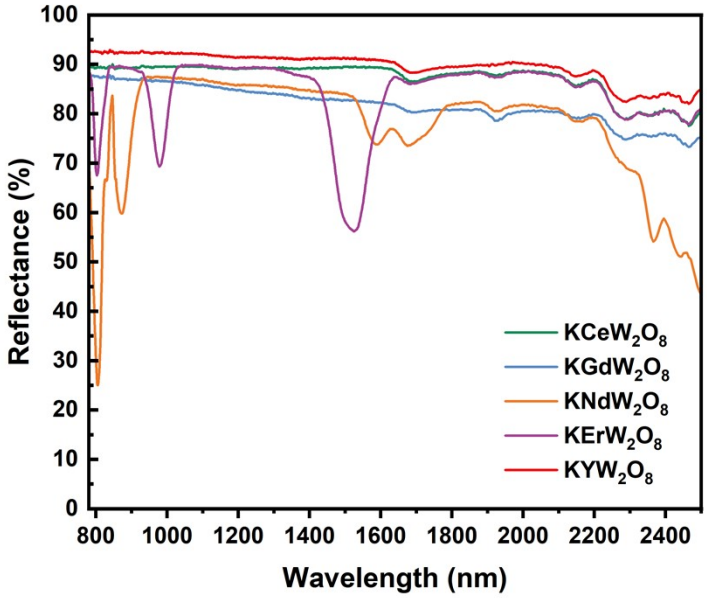

Figure. S1. The near-infrared reflection spectrum of the coating.

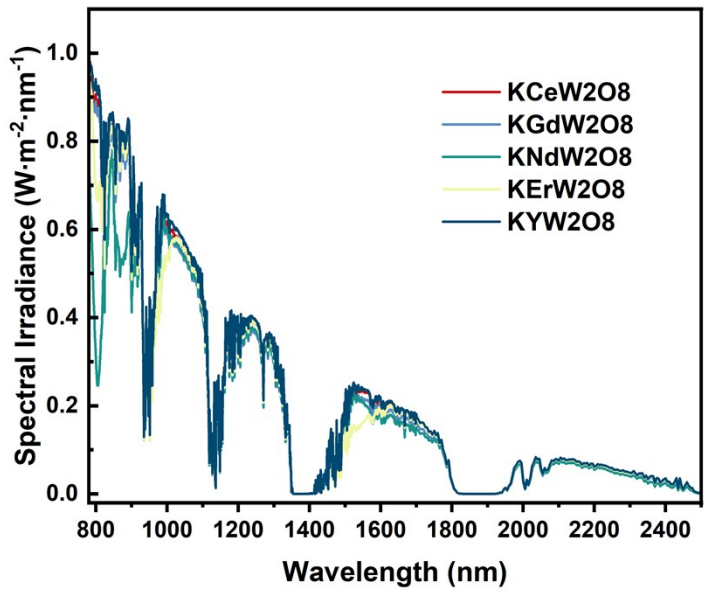

Figure.S2. The near-infrared solar reflectance spectrum of the coating.

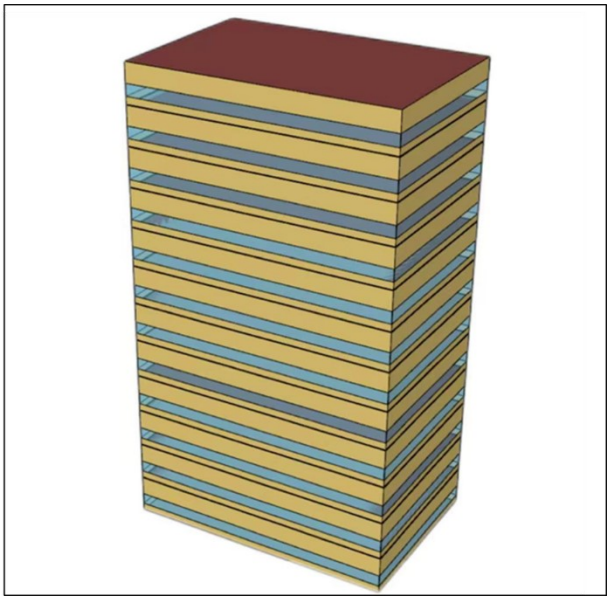

Figure.S3. Building model.

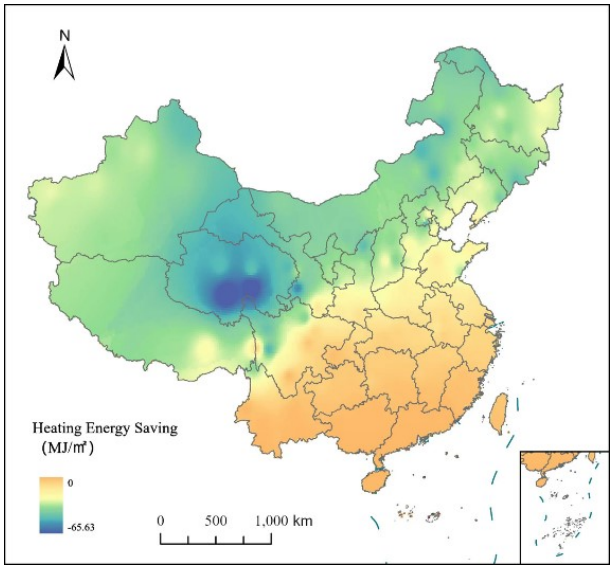

Figure.S4. Predicted total cooling energy savings after expansion of all buildings.

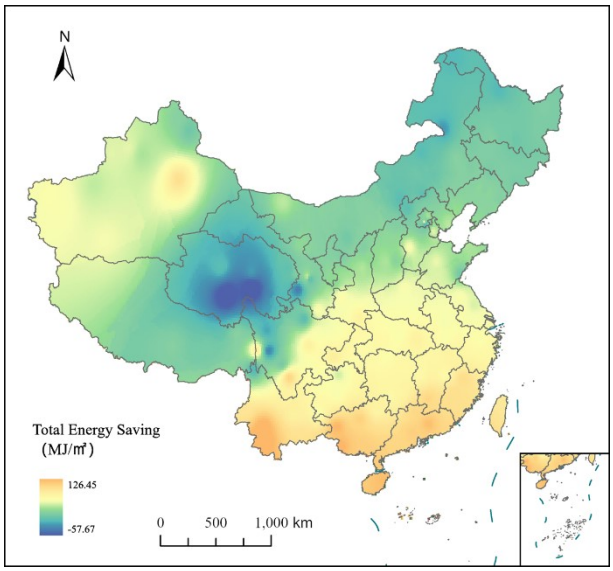

Figure S5. Predicted annual HVAC (heating and cooling) energy consumption simulation results after expansion of all buildings.

Table S1. Unit cell parameters of synthesized pigment samples.

Sample	$NaCeW_2O_8$	$KNdW_2O_8$	$KGdW_2O_8$	$KErW_2O_8$
Space group	I41/a	C2/m	C2/c	C2/c
a/Å	5.43	10.16	10.69	10.63
b/Å	5.43	10.77	10.45	10.32
c/Å	12.09	7.49	7.61	7.54
Volume/Å^3	355.90	663.51	643.65	627.07
2θ range/degree	10-80	10-80	10-80	10-80
R_{wp}	9.23%	9.54%	11.72%	10.15%
R_p	5.87%	6.91%	8.05%	7.25%
χ^2	0.83	0.50	1.20	1.12

Table S2. Color coordinates, absorption edges, and band gaps of $KREW_2O_8$ (RE=Ce, Nd, Gd, Y, Er) pigment samples.

Sample	L*	a*	b*	c*	Absorption edge (nm)	Eg（eV）
$KCeW_2O_8$	99.75	1.24	-4.76	4.92	396	3.13
$KNdW_2O_8$	93.77	16.20	-29.06	33.27	-	-
$KGdW_2O_8$	99.37	1.24	-4.75	4.91	473	2.62
KYW_2O_8	99.42	1.24	-4.75	24.86	543	2.28
$KErW_2O_8$	96.47	23.95	6.68	4.91	-	-

Table S3. Near-infrared reflectance and near-infrared solar reflectance of $KREW_2O_8$(RE=Ce, Nd, Gd, Y, Er) and TiO_2 pigment samples.

Sample	R	R*
TiO_2	79.81%	82.76%
$KCeW_2O_8$	94.15%	93.95%
$KNdW_2O_8$	86.41%	80.38%
$KGdW_2O_8$	89.61%	90.69%
$KErW_2O_8$	89.56%	88.91%
KYW_2O_8	93.66%	94.09%

Table S4. Simulated temperatures and temperature differences of $KREW_2O_8$ (RE=Ce, Nd, Gd, Y, Er) Coating samples.

Samples	0 min（°C）	10 min（°C）	△T1（°C）	△T2（°C）
acrylic resinz NO.1	25.0	41.1	16.1	0
TiO_2	25.1	35.5	10.4	5.7
$KCeW_2O_8$	25.8	30.4	4.6	11.5
acrylic resinz NO.2	25.9	43.8	17.9	0
$KNdW_2O_8$	25.4	34.8	9.4	8.5
$KGdW_2O_8$	24.9	33.5	8.6	9.3
$KErW_2O_8$	25.2	34.2	9.0	8.9
KYW_2O_8	25.0	32.4	7.4	10.5

Table S5. Near-infrared reflectance and near-infrared solar reflectance of $KREW_2O_8$ (RE=Ce, Nd, Gd, Y, Er) Coating samples.

Sample	R	R*
$KCeW_2O_8$	87.32%	89.07%
$KNdW_2O_8$	77.25%	76.78%
$KGdW_2O_8$	81.80%	85.09%
KYW_2O_8	89.56%	91.60%
$KErW_2O_8$	84.02%	84.38%