Electronic Supplementary Material (ESI) for Nanoscale.

Supplementary Information

Surface Plasmonic Resonance Tunable Nanocomposite Thin Film Applicable to Color Filter, Heat Mirror, Semi-Transparent Electrode, and Electromagnetic-Shield

Sung Hyun Kim [a], *Yecheol Rho* [b], *Eunmi Cho* [a], *Jin Suk Myung*[a] *and Sang-Jin Lee*[*a]

[a] Chemical Materials Solutions Center, Korea Research Institute of Chemical Technology, Daejeon 34114, Republic of Korea

[b] Chemical Analysis Center, Korea Research Institute of Chemical Technology, Daejeon 34114, Republic of Korea

(*Corresponding author. leesj@krict.re.kr)

Table S1. XRD peak analysis of Ag50/PPFC at 1.23 W/cm^2 thin with Cu Kα radiation

2θ (degree)	d-spacing (Å)	FWHM (2θ)	Structure	Miller indices
38.30	2.3480	1.08	Ag (Fm$\bar{3}$m)	(111)
44.32	2.0421	1.10	Ag (Fm$\bar{3}$m)	(200)
64.62	1.4412	1.47	Ag (Fm$\bar{3}$m)	(220)
77.59	1.2293	1.52	Ag (Fm$\bar{3}$m)	(311)

Table S2. The elements composition ratio of Ag50/PPFC plasmonic composite thin films according to the single ternary composite target composition ratio was calculated by XPS.

	C 1s (Mass conc. %)	F 1s (Mass conc. %)	Ag 3d (Mass conc. %)	O 1s (Mass conc. %)
Ag10/PPFC	34.81	58.80	3.43	2.96
Ag20/PPFC	32.79	55.09	9.29	2.83
Ag30/PPFC	33.46	43.15	19.82	3.57
Ag50/PPFC	30.28	32.11	33.84	3.77

Table S3. The elements composition ratio of Ag50/PPFC plasmonic composite thin films according to the sputtering power density was calculated by XPS

	C 1s (Mass conc. %)	F 1s (Mass conc. %)	Ag 3d (Mass conc. %)	O 1s (Mass conc. %)
0.62 W/cm^2	31.86	7.19	55.83	5.12
0.98 W/cm^2	40.25	13.39	40.56	5.80
1.11 W/cm^2	34.36	24.95	35.42	5.27
1.23 W/cm^2	30.28	32.11	33.84	3.77
2.46 W/cm^2	30.02	37.21	28.65	4.12
3.69 W/cm^2	28.26	44.64	24.22	2.88
4.31 W/cm^2	27.38	49.60	19.61	3.41

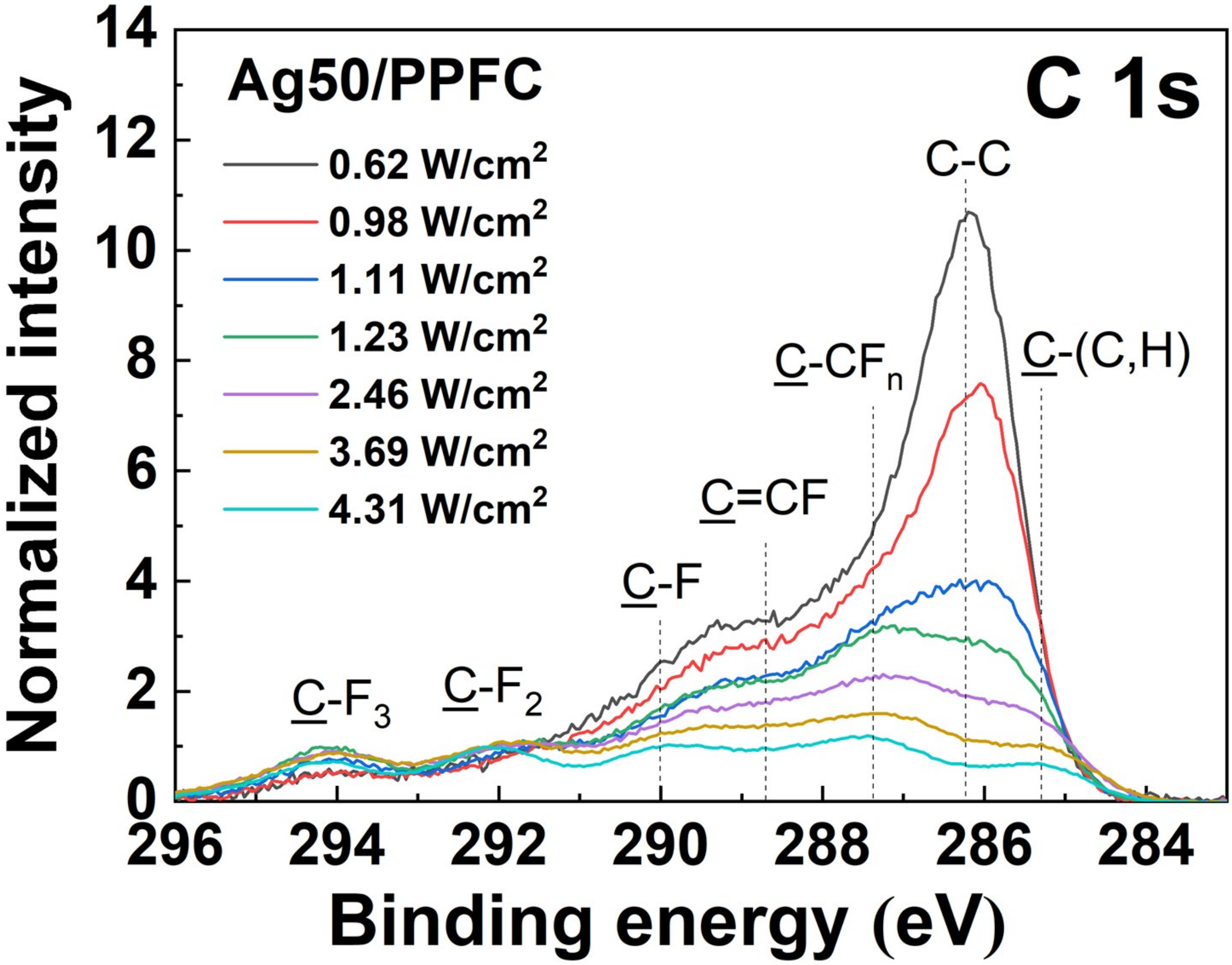

Fig. S1. C 1s XPS spectra of Ag50/PPFC nanocomposite thin films according to sputtering power density normalized based on -CF_2- (292.0 eV).

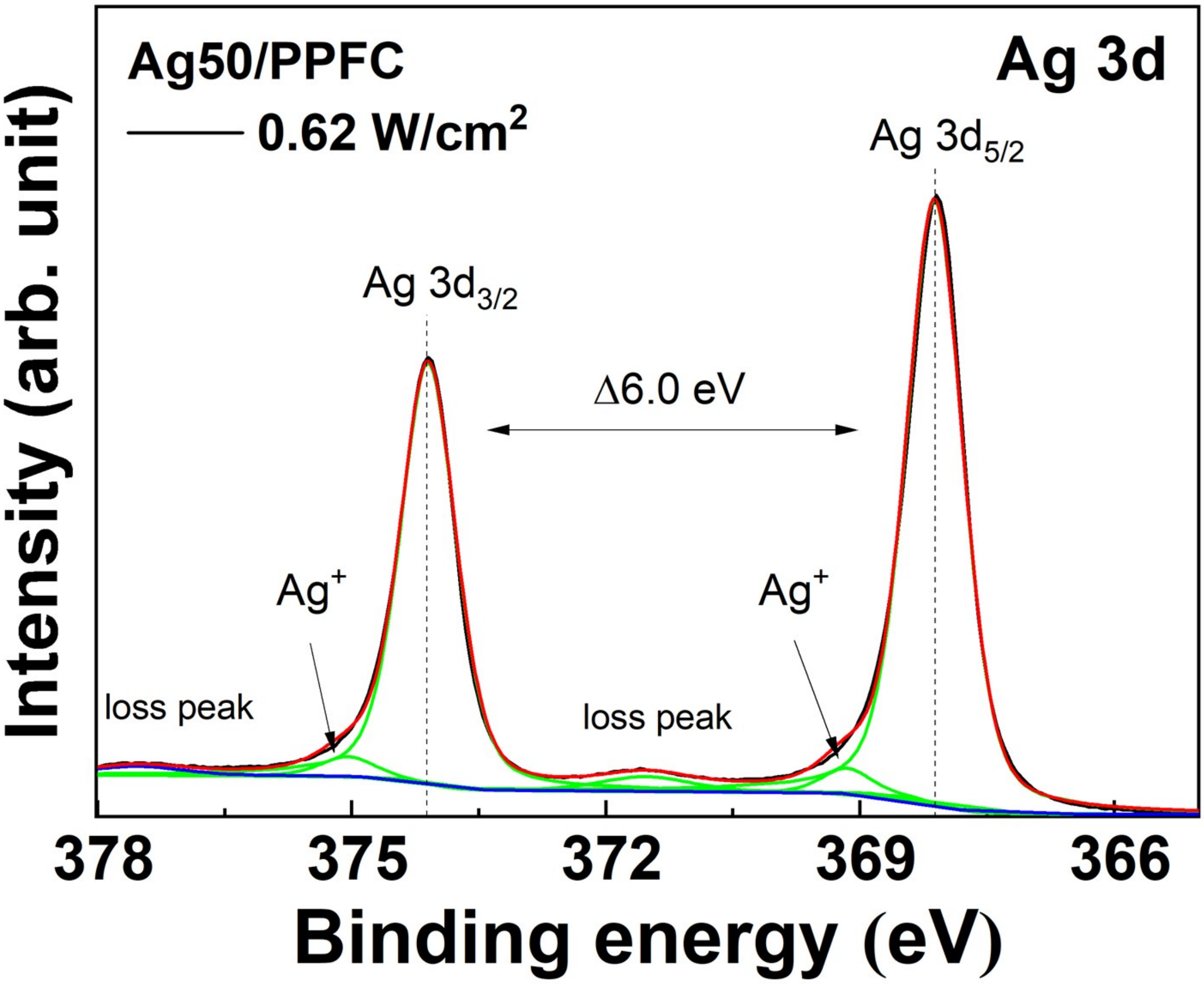

Fig. S2. Ag 3d XPS spectra of Ag50/PPFC nanocomposite thin films deposited at sputtering power density of 0.61 W/cm^2.

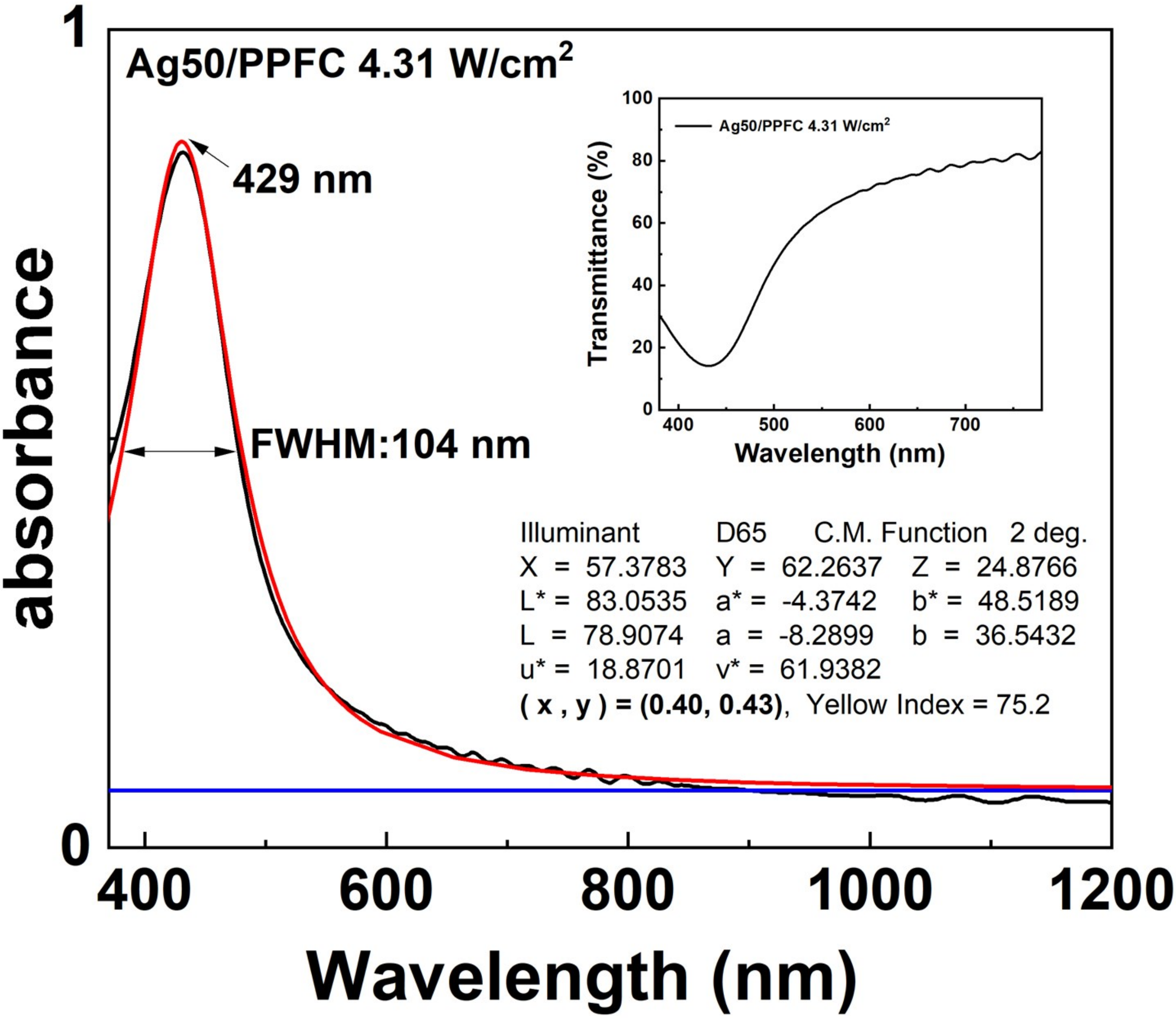

Fig. S3. Absorbance and transmittance spectra and fitting curve of Ag50/PPFC nanocomposite thin film deposited at 4.31 W/cm^2 sputtering power density by using a 400 x 700 mm^2 large-area process.

Deriving performance of the transparent heat mirror (THM)

The THM depends on the transmittance in the visible light region and the reflectance in the infrared region. Figure of merit Φ is a quantitative factor that defined as Eq. (1). T_{max} is the wavelength of maximum transmittance.

$$\Phi = T_{max}\tau_{vis}R_{IR} \quad (1)$$

($\tau_{vis} = \int_{400}^{700} T(\lambda)d\lambda$ and $R_{IR} = \int_{700}^{2000} R(\lambda)d\lambda$)

Deriving of integrated solar (SOL)

Another method to evaluate the performance of THM is integrated solar irradiance spectrum to THM films transmittance and reflectance. The integrated solar (SOL) defined as Eq. (2) and Eq. (3).

$$T_{sol} = \frac{\int T(\lambda)S(\lambda)d\lambda}{\int S(\lambda)d\lambda}, \{\lambda = 2000 - 400\ nm\} \quad (2)$$

$$R_{sol} = \frac{\int R(\lambda)S(\lambda)d\lambda}{\int S(\lambda)d\lambda}, \{\lambda = 2000 - 400\ nm\} \quad (3)$$

S is the normalized air mass 1.5 (Solar spectral irradiance at 37^{o} tilted surface) solar irradiance spectra (ASTM-G173).

Deriving of integrated visible (VIS)

The performance visible of THM also depends on the photopic luminous efficiency of the human eyes. The integrated visible (VIS) defined as Eq. (4) and Eq. (5).

$$T_{vis} = \frac{\int T(\lambda)S(\lambda)\varphi(\lambda)d\lambda}{\int S(\lambda)\varphi(\lambda)d\lambda}, \{\lambda = 700 - 400\ nm\} \quad (4)$$

$$R_{vis} = \frac{\int R(\lambda)S(\lambda)\varphi(\lambda)d\lambda}{\int S(\lambda)\varphi(\lambda)d\lambda}, \{\lambda = 700 - 400\ nm\} \quad (5)$$

φ is the photopic luminous efficiency spectra of the normal human eye according with CIE 1931 standard photometric.