Electronic Supplementary Material (ESI) for Journal of Materials Chemistry

Supporting Information for

Strongly adhesive and flexible transparent silver nanowire conductive film fabricated with high-intensity pulsed light technique

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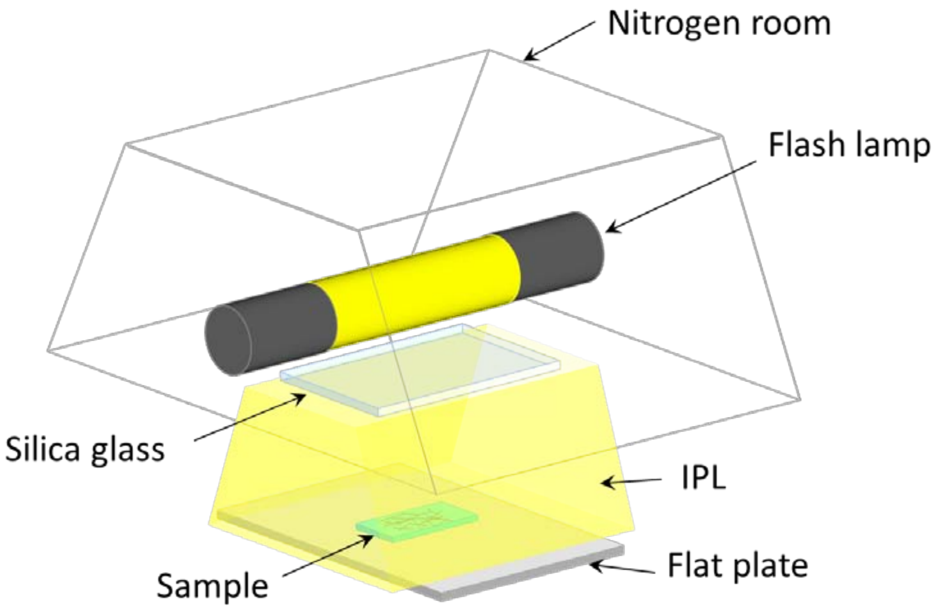

Figure S1. Schematic of HIPL. The distance between the sample and the lamp is fixed at about 10 cm. The lamp area is 7.5 cm × 15 cm. The light system is composed of a high-intensity-strobe xenon lamp enclosed in nitrogen, a powder supply, a capacitor, a pulse controller, and a light filter[1]. The heart of the light source is the high-intensity strobe, which is driven by high-powered pulsed electrical current in a short time. The lamp emits an optical spectrum that covers a wide range of wavelengths from 100 to 1000 nm. The light intensity can be controlled from several mJ/cm^2 to several hundred J/cm^2 by changing the voltage and pulse durations[1]. Samples are left on a flat plate and sintered with HIPL, which is filtered with silica glass.

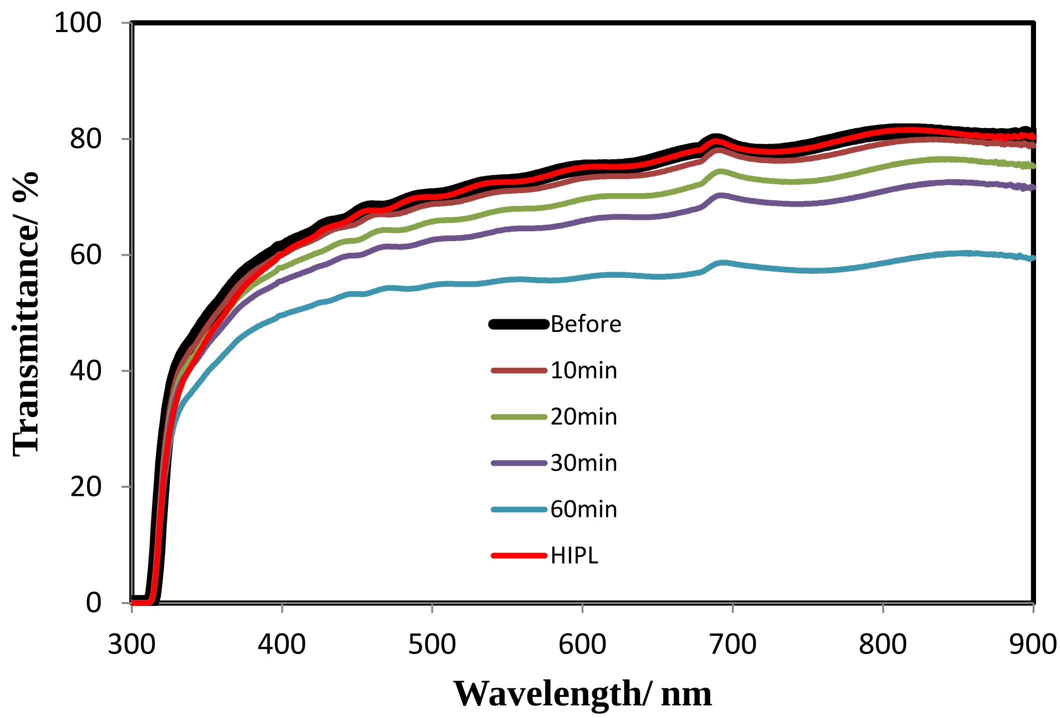

Figure S2. Transmittance spectra of PET films before and after HIPL sintering, and heated at 200 °C with different times (air as a reference).

Transmittance spectra were taken with a Jasco UV-visible-near infrared spectrophotometer (V670, JASCO Corp.) with air as a reference. Because PET didn't adsorb the irradiated energy of lamp, the transparency of PET film could not be changed with HIPL treatment (light intensity is 2.33 J/cm^2 for 50 μs exposure time). In order to determine the effect of heat to the transparency of PET films, PET films were heated in oven at 200 °C. The transparency of PET films had been drastically decreased with heating time. It is only 55.6 % transmittance at 550 nm when the PET film was heated for 60 min at 200 °C, which has been decreased for 16.9 % from original 72.5 % at 550 nm.

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Table S1: Characteristic parameters

	Ag	PET
Density (g·m/cm^3)	10.5	1.4
Specific heat, C_p (J/kg·k)	234.8	729.9
Thermal conductivity (W/m·k)	420	0.24
Thickness (μm)	0.5	3000

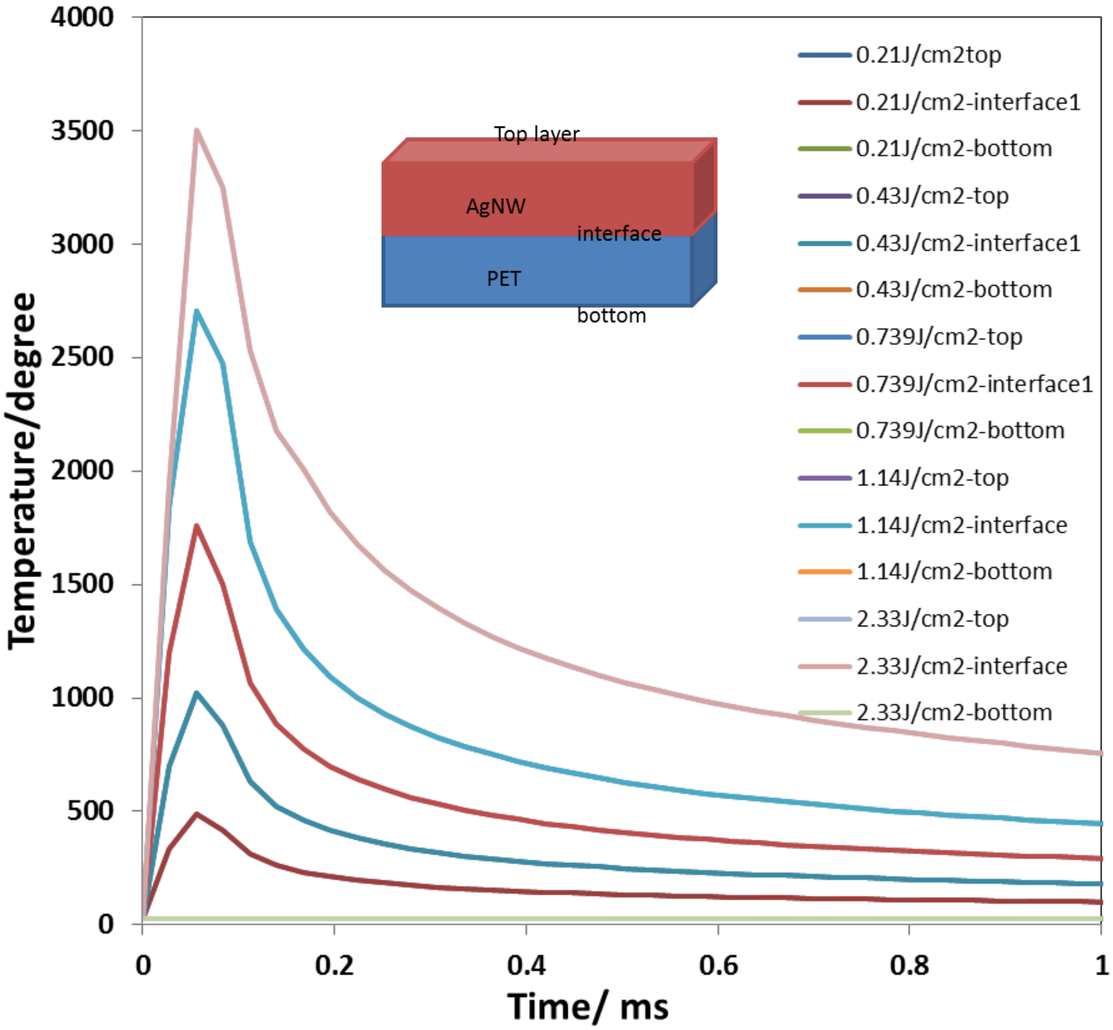


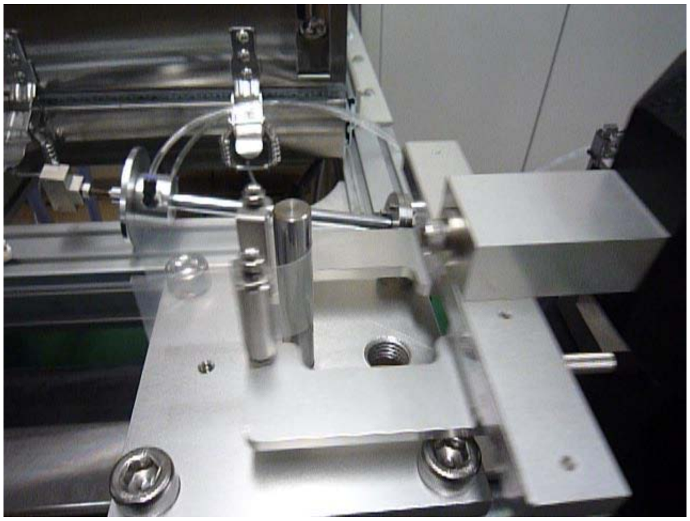
Figure S3. Simulated temperature change in the dense Ag film and at the interface with various light intensity.

The temperature in the interface and top layer is same because the thickness of Ag film is so thin. The temperature of interface will be gradually decreased when the thickness of Ag film is over 1000 nm due to the heating transferring loss. At present, the thickness of Ag film is only 500 nm even below it, so the heating can be transferred from Ag film to interface.

Table S2: Temperature distribution with different light

Temperature/degree	Top layer	Interface	Bottom
0.21 J/cm^2	489(97.8)	489(97.8)	25
0.43 J/cm^2	1024(204.8)	1024(204.8)	25
0.739 J/cm^2	1759(351.8)	1759(351.8)	25
1.14 J/cm^2	2700(540)	2700(540)	25
2.33 J/cm^2	3500(700)	3500(700)	25

Due to the AgNW film is mesh structure on the PET substrates, the actual temperature in the mesh film is far lower than that in a dense film. Here, the actual temperatures are estimated and shown in parentheses according the amount of metal in the film.



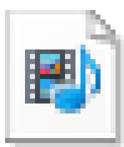


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Figure S4. The bending test photo and video.

References

1. http://www.novacentrix.com/