# Supporting information

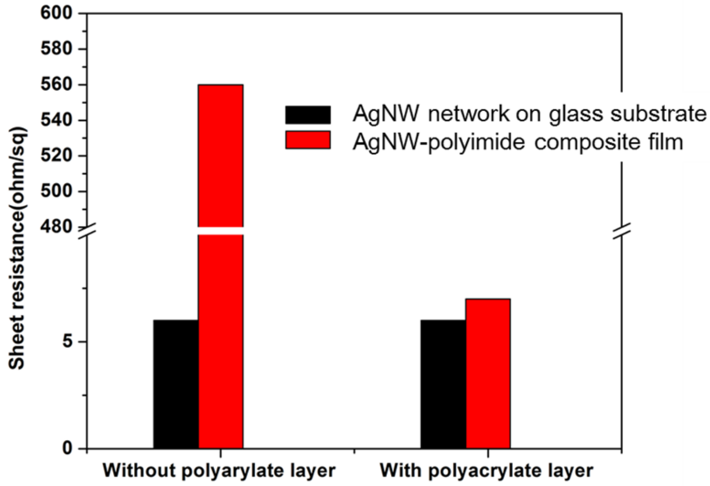


Figure S1. Sheet resistance of composite film without or with a thin polyacrylate layer. The two composite films were prepared by transferring the same coating density of AgNW from glass release substrate.

Composite films with a thin polyacrylate layer and without a thin polyacryalte layer were prepared by transferring the same coating density of AgNW network from glass release substrate with a sheet resistance of 6 ohm/sq. A composite electrode without a polyacrylate layer had a resistance of 565 ohm/sq. However, the composite film with a polyacrylate layer had lower resistance of 7 ohm/sq shown in Figure S1.

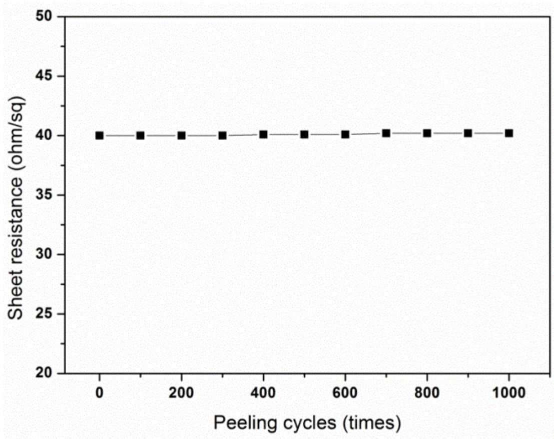


Figure S2. Transient sheet resistance of a composite film during 1000 cycles of adhesion and peeling.

The robustness of the composite film was evaluated by repeated adhesion and peeling test in Figure S2. 3M Scotch tape (20 mm × 20 mm) was applied on the conductive surface of the composite film with a 25 mm × 25 mm area. The tape was finger-pressed to promote adhesion with the test film and then peeled off. After 1000 cycles of adhesion and peeling, mere 0.5 ohm was measured, indicative of strong mechanical bonding between AgNW network and ultrathin polyacryalte layer, and between the ultrathin layer and polyimide substrate as well.

Table S1. Detailed sample information and thermal properties

| Sample | Thickness ($\mu$m) | Density (g/cm$^3$) | Thermal diffusivity (mm$^2$/s) | | Thermal conductivity (W/m·k) | | Electric conductivity (S/cm) |
|---|---|---|---|---|---|---|---|
| | | | In-plane | Out-of-plane | In-plane | Out-of-plane | |
| Copper foil | 150 | 4.96 | 70.23 | 0.28 | 132.51 | 0.35 | 19125.83 |
| 7 ohm/sq AgNW/polyimide composite film | 150 | 1.23 | 60.45 | 0.15 | 130.23 | 0.21 | 18673.56 |
| 40 ohm/sq AgNW/polyimide composite film | 150 | 1.23 | 55.3 | 0.15 | 125.3 | 0.21 | 17673.67 |

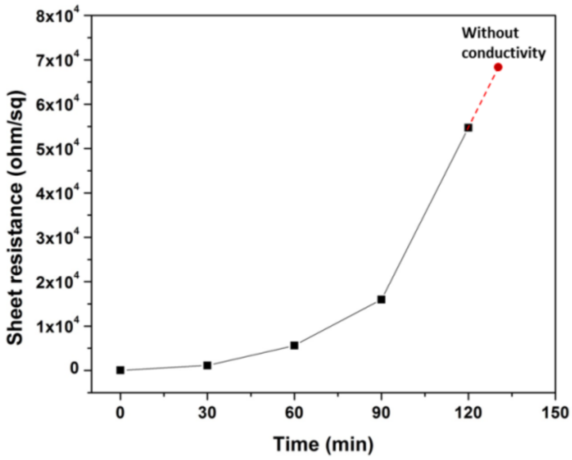


Figure S3. Transient sheet resistance of AgNW network on a glass release substrate at 200 °C

The transient sheet resistance of AgNW network on a glass release substrate was measured at 200 °C. As shown in Figure S3, sheet resistance increased dramatically, after 120 min, AgNW network lost the conductivity due to oxidation at high temperature.

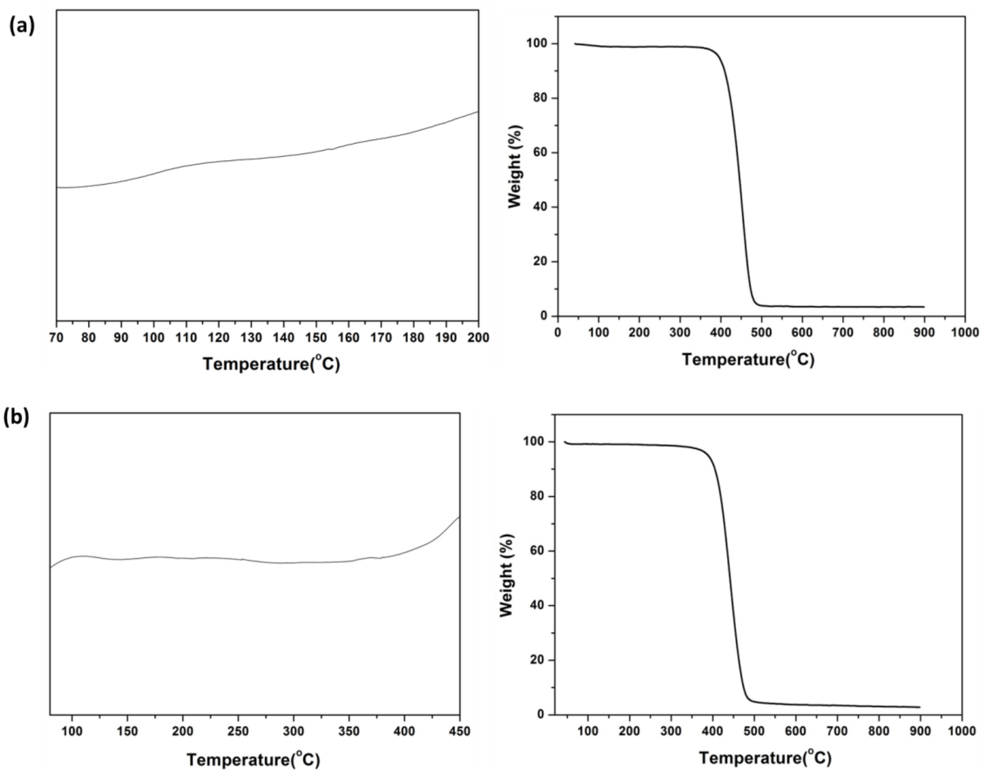


Figure S4. DSC (*left*) and TG (*right*) analysis of (a) the polyacrylate coating and (b) polyimide film, respectively.

DSC (*left*) and TG (*right*) analysis of the polyacrylate coating show Tg (glass transition temperature) around 140 °C and thermal decomposition at 350 °C in Figure S4(a). The polyimide film has Tg (*left*) around 260 °C and began to degrade at 350 °C (*right*) in Figure S4(b).

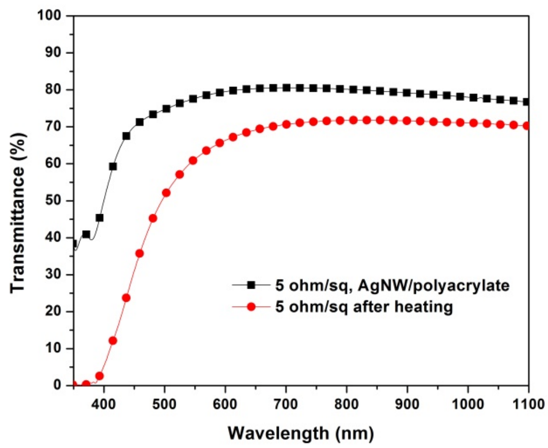


Figure S5. Transmittance spectra of a fresh AgNW/polyacrylate composite film and its composite film after heating at 200 °C for 168 h.

The thermostability of the AgNW/polyacrylate composite is checked by measuring the visual transmittance of the composite film after heating at 200 °C for 168 h in Figure S5. Due to the polymer substrate oxidation, the transmittance at 550 nm decreased from 77.7% to 61.3%.

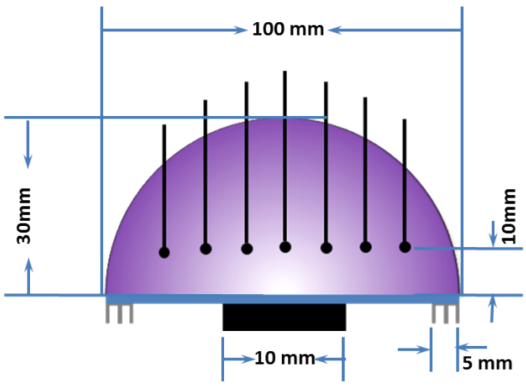


Figure S6. The dimension of the thermal diffusion apparatus