1. Preparation procedures of silver nanoparticle ink

0.5 g of AgNO₃ + 0.5 g of PVP

Water was added

The mixture of AgNO₃ and PVP was dissolved in 100 ml of water

NaBH₄ was added

The solution was filtered

Ag ink was obtained after filtration

Ag ink was obtained after the addition of NaBH₄
2. The product obtained after reducing AgNO$_3$ with NaBH$_4$ in the absence of PVP

**Figure S1.** (a) The photograph of the product obtained after reducing AgNO$_3$ with NaBH$_4$ in the absence of PVP, which was insoluble in water and settled down at the bottom of the test tube. (b) The SEM image of the obtained particles. The particles had size of ~ 1µm and were aggregated.
3. Optical microscopic image of the silver film

![Image of optical microscopic image of the silver film](image)

**Figure S2.** Optical microscopic image of the solution processed silver film on a plastic substrate.

4. Resistance measurements of the Ag film using a multi-meter.

![Resistance measurements](image)

**Figure S3.** The resistance of the Ag nanoparticle film on a plastic substrate measured across the two ends of the Ag film (A) before and (B) after deformation. Different appearance colors are due to the different reflection of surrounding light.
5. Thermogravimetric analysis (TGA) of Ag ink

The thermal behaviours of the Ag ink were investigated by Thermogravimetric analysis (TGA). The TGA thermogram of the dried Ag ink (dried at room temperature) was recorded with a heating rate of 10 °C min\(^{-1}\) in air and are shown in Figure S3. The TGA of the dried Ag ink showed a decrease of almost 0.5 wt% by 100 °C, which was due to the evaporation of ethanol present in the pores of the dried Ag ink. Further increase of temperature showed a decrease of another 2 wt% by 350 °C, which was due to the decomposition of PVP polymer present in the Ag Ink. The TGA result shows that only 2-3 wt% of PVP present in the purified Ag ink. The result indicates that the density of the PVP on the nanoparticle surface is very low due to the week binding of PVP to the nanoparticle surface.

![Figure S4. TGA curve of Ag ink at a heating rate of 10 °C min\(^{-1}\) in air](image-url)
6. Conductivity vs. thickness of the Ag film

![Graph showing conductivity vs. film thickness](image)

**Figure S5.** Film thickness dependent conductivity of the Ag film. The conductivity increases rapidly with the increasing thickness up to 400 nm and remains nearly constant above 400 nm thicknesses. The maximum conductivity was measured to be ~0.7.0x10^5 S·cm^{-1} at Ag film thickness of 400 nm and above.

7. Solar cell device fabrication and measurements

P3HT (30mg/ml) and PCBM (30mg/ml) were dissolved (1:1 ratio) in dichlorobenzene (DCB) solvent and spin coated on a ITO/PEDOT electrode using 800 rpm at 70 s and annealed at 120 °C for 10 min under N_2 atmosphere. Subsequently LiF (1 nm) and Al (100 nm) evaporated at 1x10^{-6} bar vacuum to complete the device fabrication. The silver nanoparticle ink was deposited onto the P3HT-PCBM polymer film on the other end of device and the device structure is shown in Fig.4a. The thickness of the active layer film was measured to be 120 nm by using a surface profiler. The device structure is ITO/PEDOT:PSS (40nm)/P3HT:PCBM (120nm)/LiF (1nm)/Al (100nm). The I-V curves
were measured by using a solar simulator AMG 1.5 light source of 100mW/cm$^2$ intensity. The light source employed was a Newport 300W xenon light source, controlled by a Newport digital exposure controller, which simulates the solar light through an AM 1.5G sunlight filter. The incident light intensity was focused and calibrated to 1 Sun (100 mW/cm$^2$) with a standard Si solar cell (PV measurements, USA).

**Legend for Supporting Movie**

The nanoparticle dispersion was deposited onto the glass substrate and the solvent was evaporated using air dryer, which resulted in formation of a shiny silver film without any annealing.