Supporting Information

# The Effect of Nanowire Length and Diameter on the Properties of Transparent, Conducting Nanowire Films

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## METHODS

**Materials**: Ethylene glycol was purchased from J.T. Baker. Polyvinylpyrrolidone (MW = 55,000), $Fe(NO_3)_3$, NaCl and $AgNO_3$ were purchased from Sigma-Aldrich. All chemicals were used without further purification.

**Reaction**: Flasks and stir bars were cleaned with concentrated nitric acid, thoroughly rinsed with DI water, and dried in an 80 °C oven before use. Once dry, the flasks were allowed to cool to room temperature before any reactants were added. The reaction was carried out as described in the text.

**SEM**: To prepare the samples for SEM, a small chip of a silicon (Si) wafer (5 mm by 5 mm) was cut for each sample and placed onto a piece of double sided tape in a Petri dish. The silver nanowires were suspended in DI water with vortexing and sonication before 5 μL of the suspension was placed on the Si chip. After drying, the silver nanowires were rinsed with a gentle flow of water for 30 - 60 seconds and dried again.

**Silver thin film preparation**: After washing and centrifugation, silver nanowires were dispersed in DI water using vortexing and brief sonication. Set volumes of the well-dispersed silver nanowires were diluted in 200 mL of DI water and filtered onto 0.6 μm Isopore membrane filters (Millipore 0.6 μm DTTP04700). As soon as the water passed through the membrane, but while the membrane was still damp, the filtrate was immediately put into contact, by hand, with a glass slide coated with Aleene's Clear Gel Tacky Glue© (preparation described below). It is important not to let the filtrate dry completely before placing it in contact with the glue in order to obtain complete transfer of the nanowires. The membrane filter was firmly pressed against the glue layer on the glass slide and rubbed before the membrane was peeled away, leaving behind the silver nanowire film. The sheet resistance and transmittance of the film were measured using a four-point probe (Signatone S-1160A-5) and a UV-Vis-NIR spectrometer (Cary 6000i), respectively. The baseline on the UV-Vis-NiR spectrometer was corrected using a slide coated with glue, without the silver nanowire film.

To prepare the glass slides coated with clear glue, the glass slides were plasma cleaned for three minutes in a plasma asher (Emitech K-1050X) and within five minutes they were coated with Aleene's Clear Gel Tacky Glue© using a spin coater (Chemat Technology KW-4A). The spin coater program was ramped up to 500 rpm (250 rpm sec⁻¹), where it spun for 15 seconds before ramping up (500 rpm sec⁻¹) to 3500 rpm, where it spun for 45 seconds before coming to a stop (-500 rpm sec⁻¹). The thin layer of glue (8 ± 0.1 μm, Veeco Dektak 150) on the slides was allowed to dry for 1 hour in air before the silver nanowires were printed onto the glue.

**Concentration of Silver Nanowires**: To measure the yield of silver nanowires obtained from the reactions, a given amount of the nanowire dispersion was filtered, washed with water, dried for one day in a nitrogen environment, and weighed.

**Calculation of Area Coverage**: The silver nanowires were filtered using a Millipore glass filter holder (XX104700) with a prefilter diameter of 35 mm, to create a circular silver nanowire thin-film print with an area of 962 mm$^2$. Set volumes of the well

dispersed silver nanowires of known concentration were diluted in 200 mL of DI water. From this dilute solution, known volumes were used to make a thin-film print. The number of wires was determined by dividing the grams of silver in solution by the density of silver (10.49 $g/cm^3$) and the average volume of the wires. Knowledge of the wire's average diameter, length, and number density enabled the fractional area coverage to be calculated using equation 6.
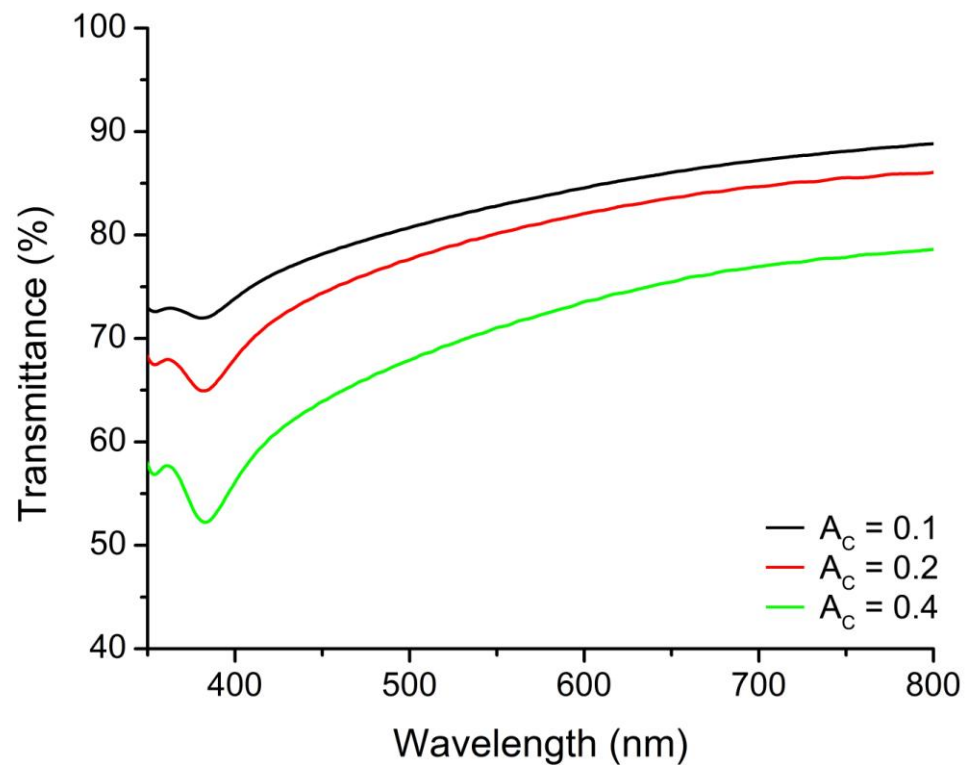
**Figure S1**. The transmission spectra of films made from silver nanowires with diameters of 50 nm and lengths of 10 μm.