Supporting information for:

Synthesis of highly conductive, uniformly silver coated carbon nanofibers by electroless deposition.

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ELECTROLESS SILVER DEPOSITION REACTION

The widely accepted reaction set for the Tollen's reagent preparation is as follows:

$$2\ AgNO_3 + 2\ KOH \rightarrow Ag_2O + 2\ KNO_3 + H_2O \quad (1)$$

$$4\ NH_3 + Ag_2O + 2\ KNO_3 + H_2O \rightarrow 2\ [Ag(NH_3)_2]NO_3 + 2\ KOH \quad (2)$$

The deposition reaction then proceeds as follows:

$$CH_2OH(CHOH)_4COH + 2\ Ag(NH_3)_2^+ + 2\ OH^-$$

$$\rightarrow 2\ Ag + CH_2OH(CHOH)_4COOH + 4\ NH_3 + H_2O \quad (3)$$

As is shown in equation (1), the potassium hydroxide is restituted in solution upon dissolution of silver oxide with ammonia. The amount of potassium hydroxide therefore directly influences the concentration of hydroxide ions in the tollen's reagent and thus the reaction dynamics. Equation (3) also shows that at stoichiometric equilibrium there is 1 Mol glucose for 2 Mol silver.

NANOPARTICLES PACKING

The measurement of the volume ratio of the nanoparticles provides information about the efficiency of the electrical network within the material. Figure S1 shows the cross section of the nanoparticles layer for the highest specific conductivity measured. The 127 µm thickness along with the 5.14×10^{-3} g/cm^2 makes for a 0.4 g/cm^3 density. Approximating the nanofibers to be the same as silver, we obtain a packing density of approximately 4%, which is much lower than the percolation threshold for conventional conductive fillers.

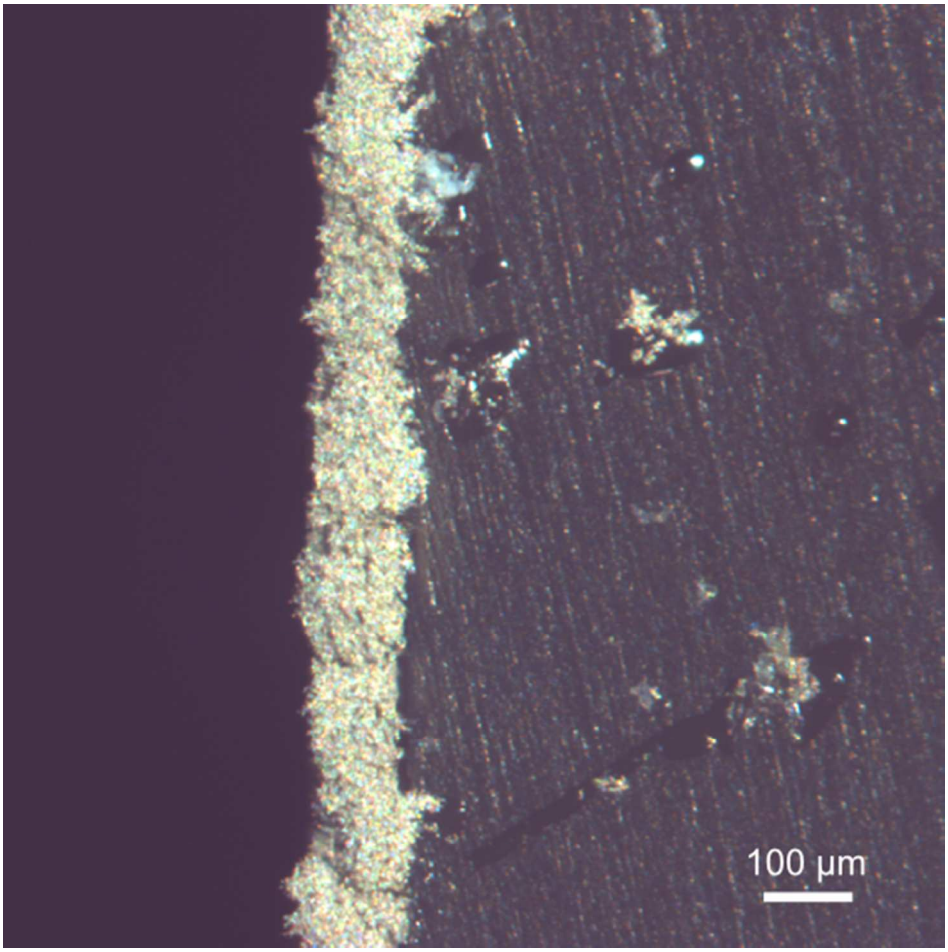

Figure S1. Optical microscope image of the cross section of the highest specific conductivity sample with a Ag/dextrose molar ratio of 1.14. The average thickness of the nanoparticle film is 127 µm for a density of 0.4 g/cm^3.

OXIDATION

The experiments for dextrose concentration and Tollen's reagent amount variation yielded significantly different results in the maximum specific conductivity reached. Moreover, at a dextrose/Ag molar ratio value of 0.88, the dextrose variation curve in Figure 8 (main text) should reach the same value as the maximum of Figure 6 since the solutions are identical. This suggests that the reaction is very sensitive to experimental conditions. Figure S2 shows a photograph of

samples at nearly identical solutions compositions. The tint difference suggests that the dextrose variation sample underwent more oxidation, which might explain the lower specific conductivity reached.

Figure S3 shows a close-up of the sample periphery. The region that resides under the funnel overhang displays a lighter color which might indicate less oxidation. Since this region is protected from the water flow during the rinsing operation, we believe that residues from the electroless deposition solution protect the particles from oxidation.

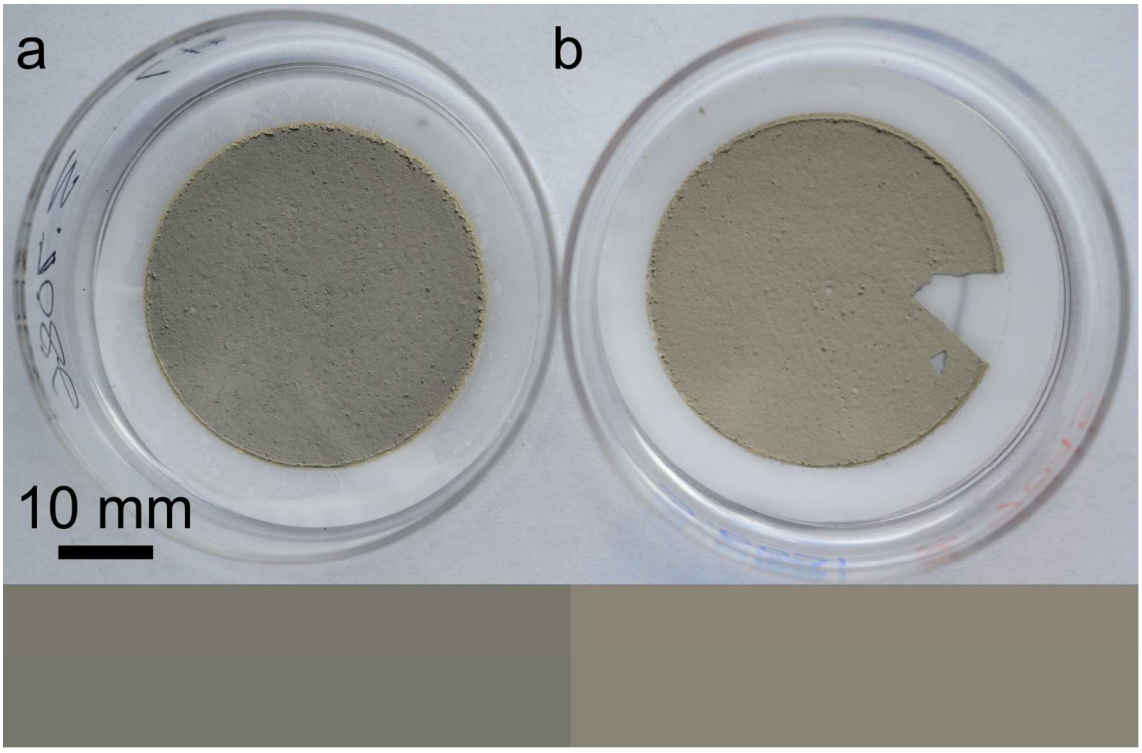

Figure S2. A photograph of samples produced during experiments on a) dextrose concentration variation and b) Tollen's reagent amount variation. The color bars show the average color picked on the samples images.

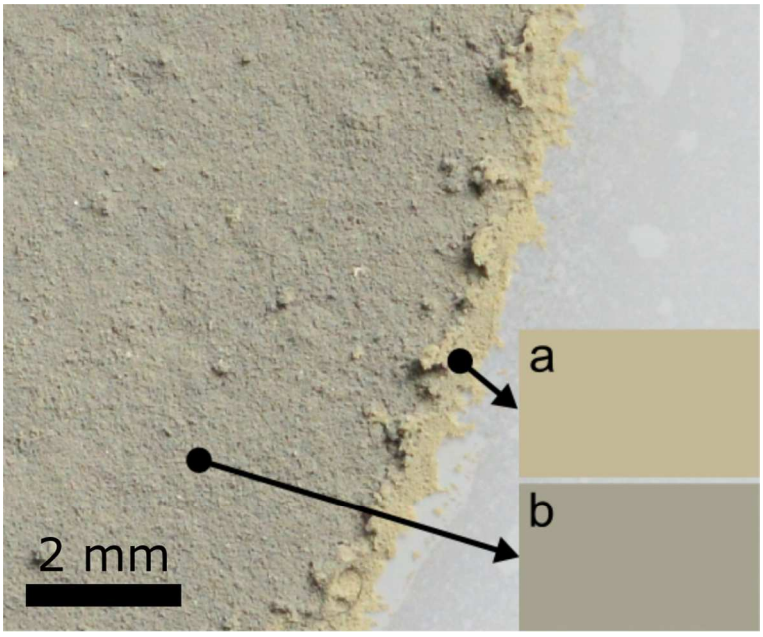

Figure S3. The edge of a nanoparticles sample after drying. The region under the ridge of the funnel (a) shows a lighter color than the bulk of the sample (b).