Electronic Supporting Information

Green preparation of flaky silver powders with nano-thickness towards electrically conductive adhesives through nanofilm transition method

Yuqiu Shen, Zhenxing Chen, Tingting Zhou, Wenchao Feng, Yi Liu*

The Key Laboratory of Low-Carbon Chemistry & Energy Conservation of Guangdong Province, School of Chemistry and Chemical Engineering, Sun Yat-sen University, Guangzhou, 510275, People's Republic of China. E-mail: amcl001@163.com; chenzx65@mail.sysu.edu.cn;

Experimental Section

Fabrication of resin-coated PET substrate

1. A coating solution, in which resin content was fixed to 5%, was prepared with a water-soluble resin and deionized water.

2. The as-prepared coating solution was printed onto PET substrate through screen printing technique.

3. After baked at 120 °C for 30 minutes, a smooth resin-coated PET substrate was achieved.

Stripping process of the silver nanofilms

Once immersed into deionized water, the silver nanofilms would be desquamated from the resin-coated substrate, which was ascribed to the excellent solubility of the water-soluble resin in deionized water.

Ultrasonic grinding of the flaky silver powders

The quantitative slurries, composing of coarse silver flakes, deionized water and the dissolved water-soluble resin, were smashed using a 5 W/m^2 intensive energy ultrasonic for 15 minutes, 30 minutes, 45 minutes, 60 minutes and 75minutes, 90 minutes respectively.

Manufacture of ECAs patterns

The flaky silver powders (as-prepared or FAgL6501 or Xinshengfeng), dibasic ester (DBE) and a handful of additives were successively added into the organic carrier which was prepared with epoxy resin (E71) and organic solvent (DBE). Afterwards, the mixture was stirred until homogeneous slurry was formed. The ratio of epoxy

resin (E71) to (DBE) was 3:7 (weight/weight). The filler loading of flaky silver powders in the slurry was fixed to 25 wt% (as-prepared) and 60 wt% (FAgL 6501, Xinshengfeng). The silver slurry was printed on a PET substrate by screen printing and was then cured at 140 °C for 45 minutes to form a ECAs pattern.

Characterization

The silver flakes and ECAs patterns were analyzed by a field emission scanning electron microscope (JSM-6330F, Japan). The X-ray diffraction studies of silver powders were performed using a D-MAX 2200 VPC X-Ray Diffractometer (RIGAKU 670, Japan). The X-ray photoelectron spectroscopy of silver powders were performed using a X-ray Photoelectron Spectrometer (ESCALab250, USA). The particle sizes of the flaky silver powders were analyzed with Particle Size Analyzer (Mastersizer 2000, UK). The specific surface area of the as-prepared and commercial silver powders were measured using a Surface Area and Porosity Analyzer (Micromeritics ASAP 2020, USA).

Supplementary figures and tables

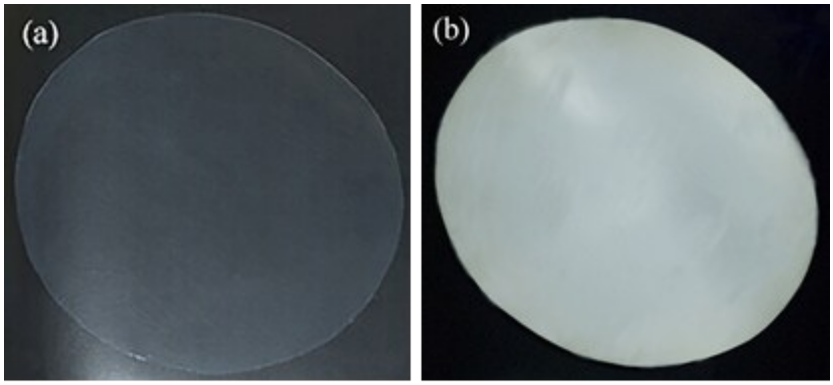

Figure S1. PET substrate (a) after screen printing with resin and (b) after PVD.

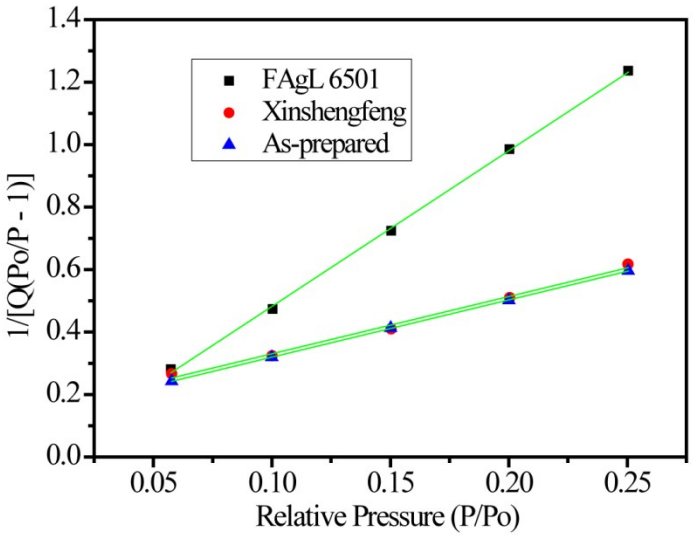

Figure S2. BET surface area plot of different flaky silver powders.

Tab.1 The specific surface area of the as-prepared and commercial flaky silver powders.

Name	BET Surface Area(m^3/g)
FAgL6501	0.8764
Xinshengfeng	2.1988
As-prepared	2.2110