Supporting Information

Green Synthesis of Silver Nanoparticles with Size Distribution Depending on Reducing Species in Glycerol at Ambient pH and Temperatures

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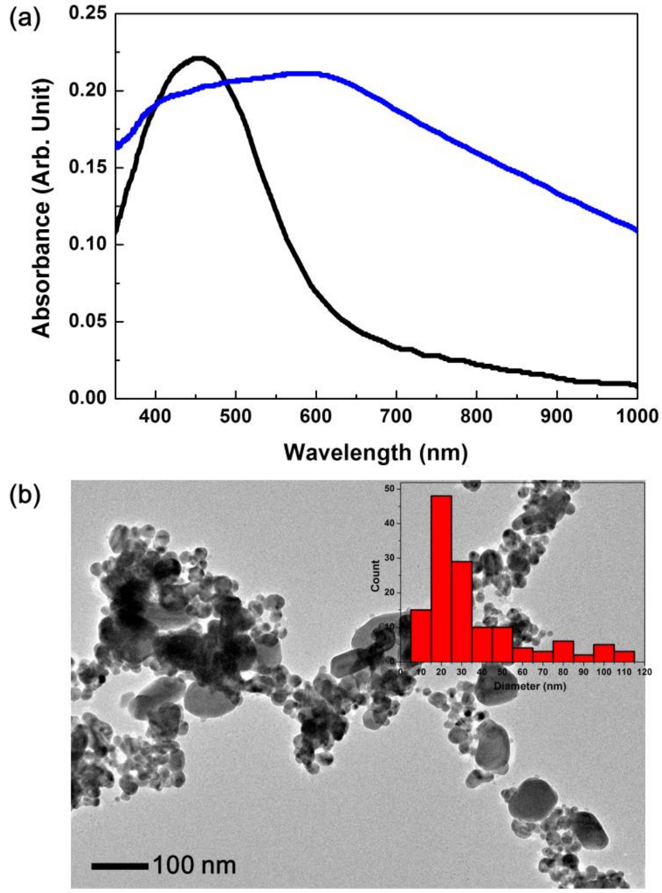


Figure S1. Silver nanoparticles can be formed in pure glycerol solvent without water. Because of the slow dissolution rate, the spectral width broadens from black to blue line in (a) after ~170 hrs after dissolution of silver nitrate in glycerol, and size distribution of formed silver nanoparticles is wide as shown in (b) TEM image.

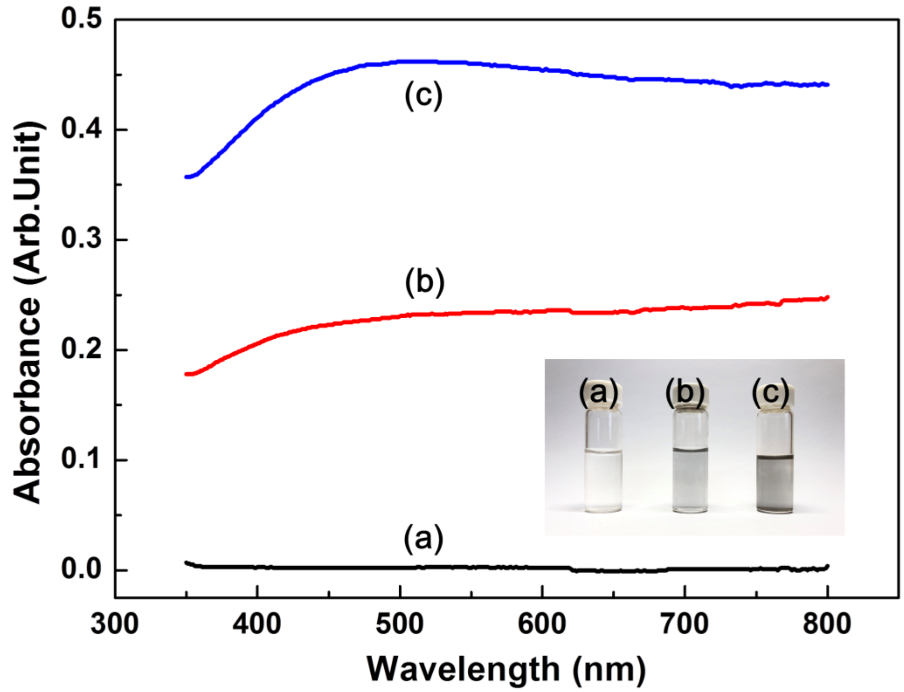


Figure S2. (a) The silver nitrate solution (100 mM, aq.), (b) the glyceraldehyde solution (200 mM, aq.) containing silver nitrate (100 mM), and (c) the mixed solution with new glycerol and glyceraldehyde solution (1 M, aq.) containing silver nitrate (100 mM) in a 4:1 ratio (v/v). While the color of the solution (b) and (c) are light grey and grey, respectively, indicating silver nanoparticles are produced, no color is observed in the solution (a). (Photograph courtesy of Tianhao Liu. Copyright 2020).

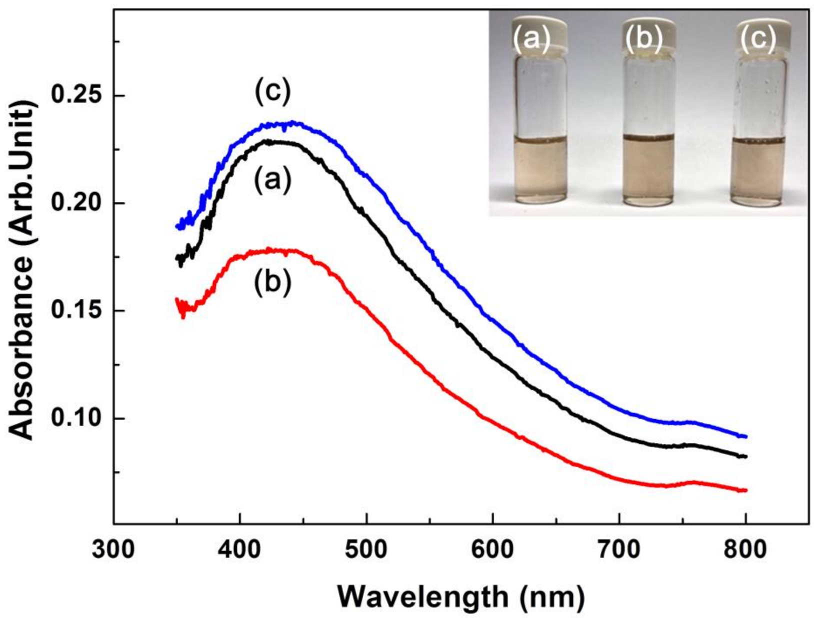


Figure S3. To investigate the synthesis of silver nanoparticles in acidic condition, 85.5 mg of silver nitrate was dissolved in (a) 0.1 mL of nitric acid (1.3 mM, aq.), (b) 0.1 mL of sulfuric acid (1.7 mM, aq.), and (c) 0.1 mL of DI water, and then each mixed solution was added to 4.9 mL of old glycerol, respectively. The color of three solutions changed to dark orange indicating that silver nanoparticles are synthesized not only neutral but also acidic condition. (Photograph courtesy of Tianhao Liu. Copyright 2020).

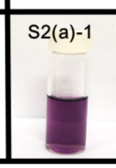
Type	Ethanol	
Temperature	RT	RT
Ambient Light	O	O
Purging	✕	✕
Waiting Time	0 min	15 hrs
Result of Radical Test		

Figure S4. The color of the radical indicator, 2,2-diphenyl-1-picrylhydrazyl (DPPH) had not changed to yellow (S2(a)-1) and was still violet even after 15 hrs (S2(a)-2) in pure ethanol solvent, which means that the ethanol does not contain free radicals. (Photograph courtesy of Tianhao Liu. Copyright 2020).

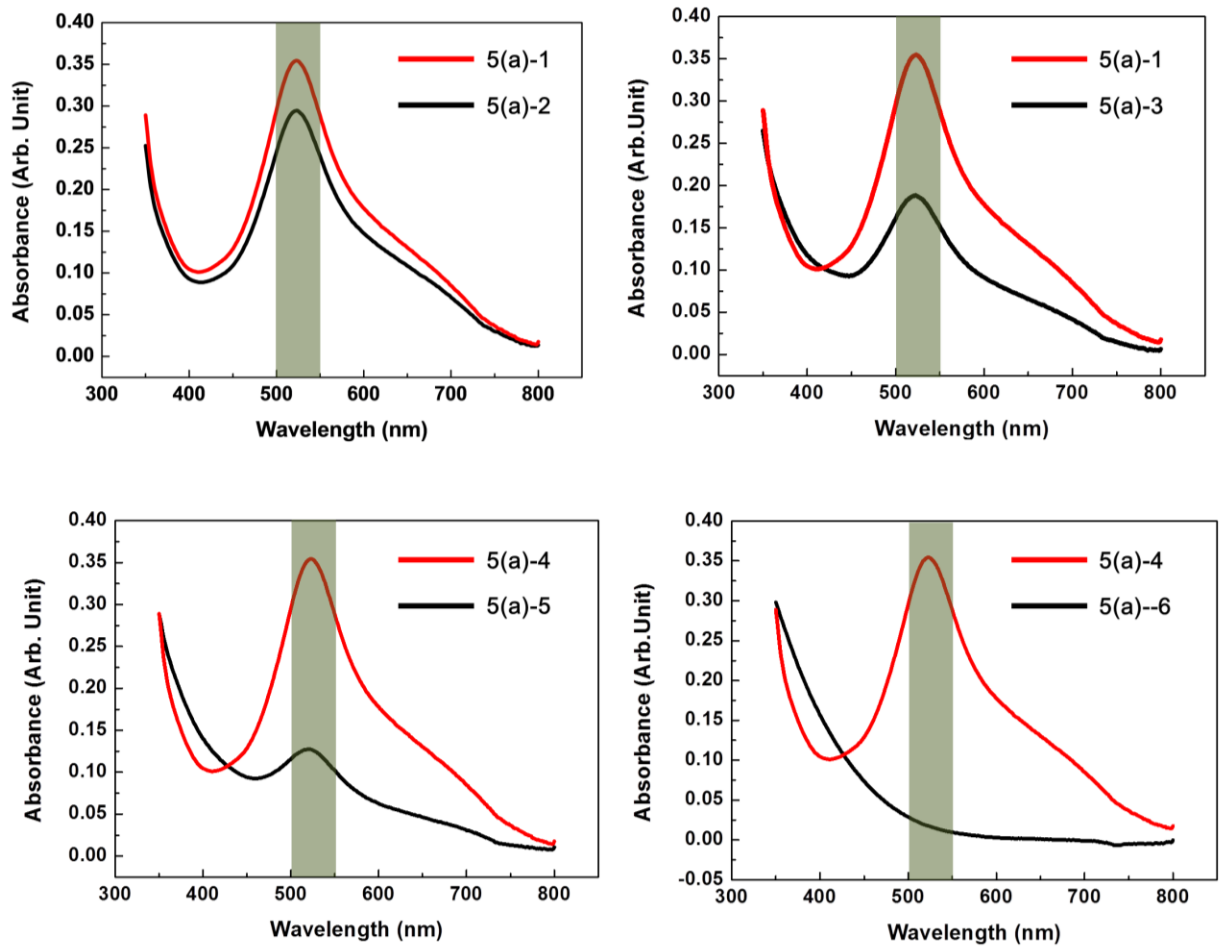


Figure S5. UV-Vis spectra for old (5(a)-1, 2, and 3) and new (5(a)-4, 5, and 6) glycerol taken at 0 min (red line) and 15 hrs (black line) after the addition of radical indicator, 2,2-diphenyl-1-picrylhydrazyl (DPPH). Scavenging efficiency is calculated from the area between 500 and 550 nm.

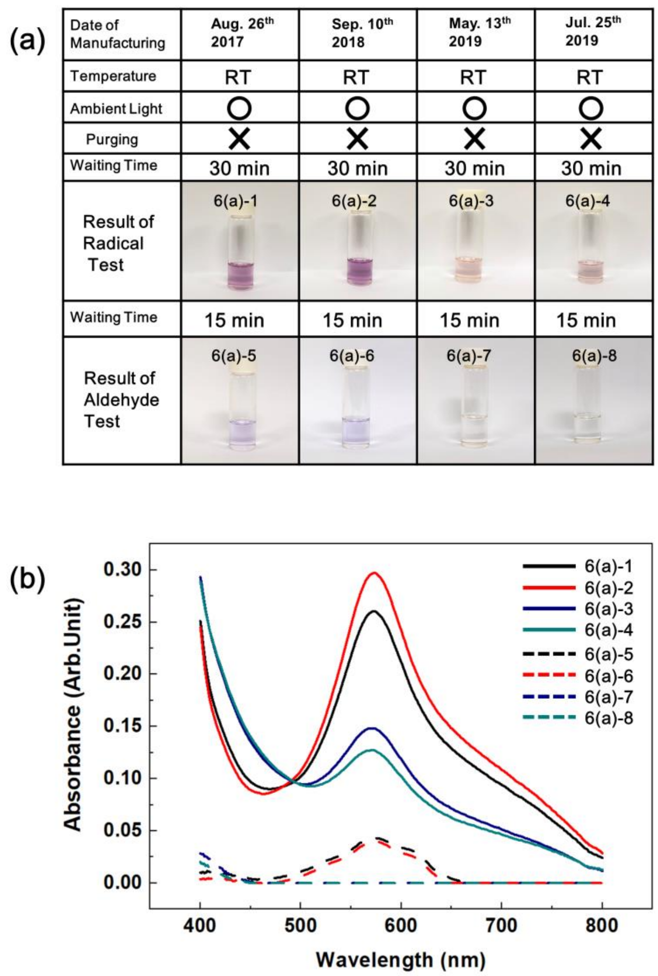


Figure S6. All glycerol tested in this experiment shows the corresponding results between the radical and aldehyde tests in (a) photos and (b) UV-Vis spectra. Old glycerols contain aldehydes [6(a)-5 and 6(a)-6], but few radicals are present [6(a)-1 and 6(a)-2]. New glycerols contain radicals [6(a)-3 and 6(a)-4], but aldehydes are not included therein [6(a)-7 and 6(a)-8]. (Photograph courtesy of Tianhao Liu. Copyright 2020).

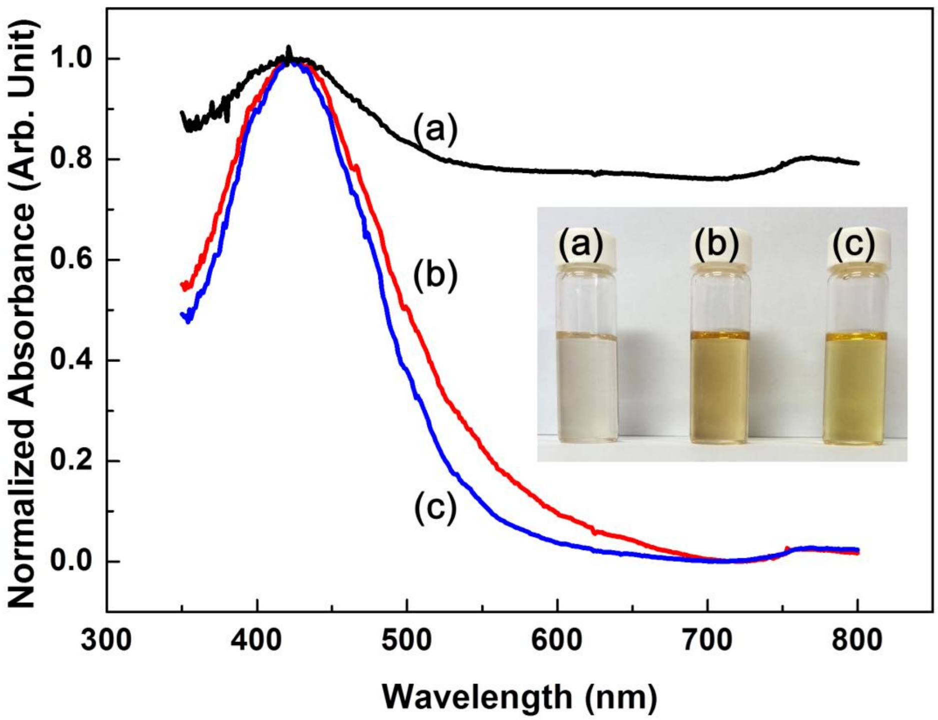


Figure S7. Silver nanoparticles generated in new glycerol containing different concentration of PVP [(a) 0.4%, (b) 4%, and (c) 40%, w/v] and their UV-Vis spectra. The smaller the amount of PVP, the faster it dissolves in glycerol. As the concentration of PVP decreases, however, the silver nanoparticles are more easily aggregated, which appears as peak broadening in UV-Vis spectra. (Photograph courtesy of Tianhao Liu. Copyright 2020).