Supplementary Information

A photochemically initiated chemistry for coupling underivatized carbohydrates to gold nanoparticles

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1. Mannose density measurement

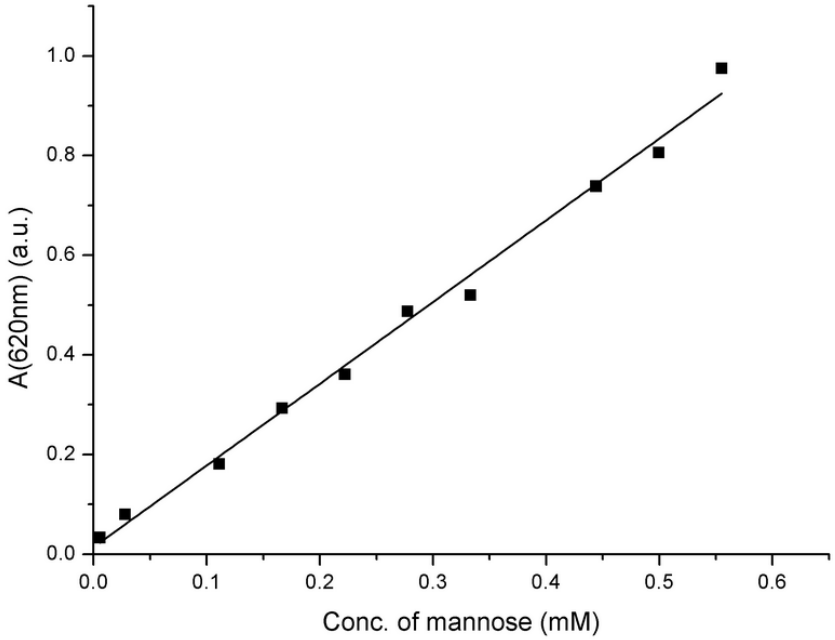

Figure 1S. Calibration curve obtained by treating various concentrations of D-mannose with anthrone/sulfuric acid and measuring the absorption at 620 nm.

2. Characterization of PFPA-functionalized and mannobiose-conjugated Au NPs

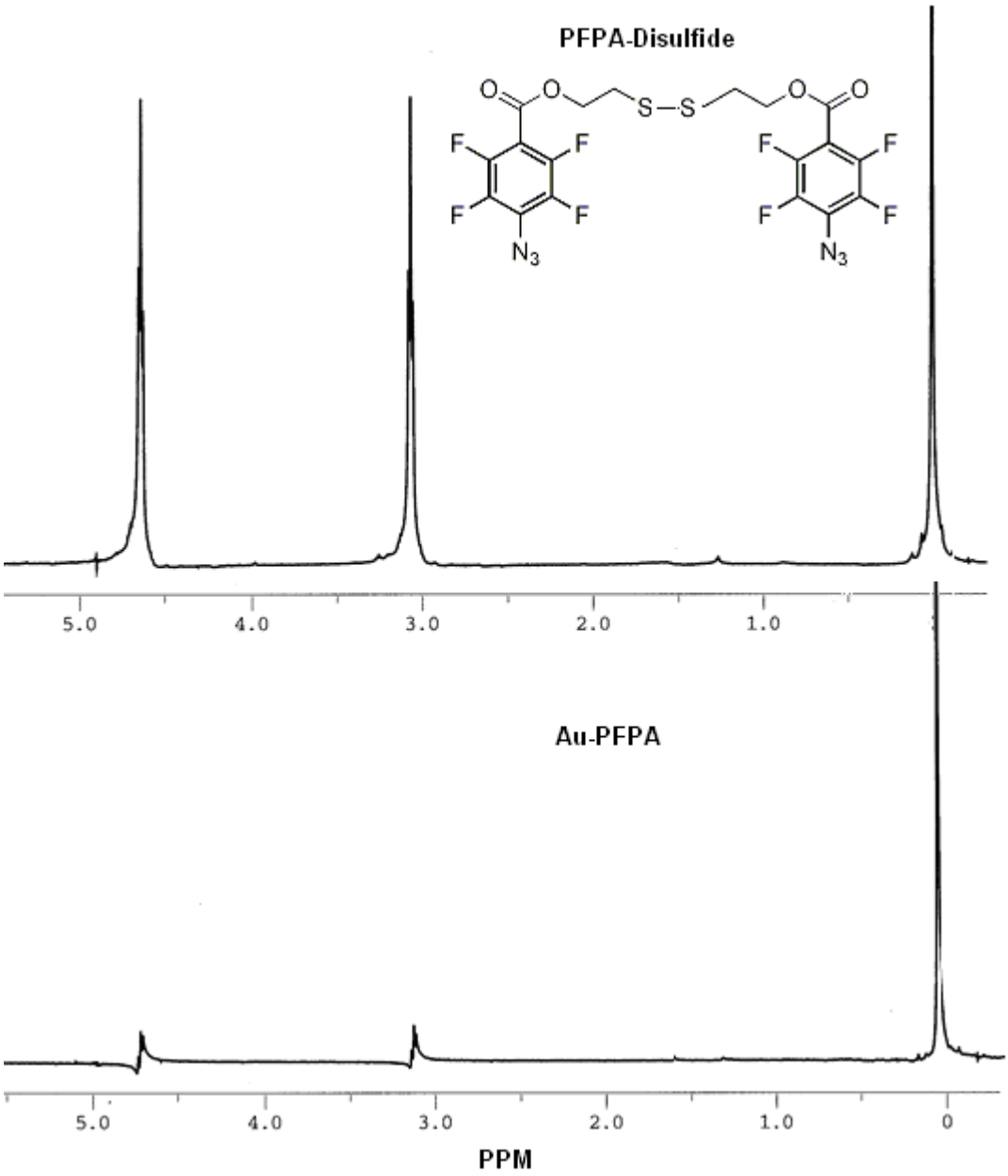

Figure 2S. ^{1}H NMR spectra of PFPA-disulfide **1** and gold nanoparticles functionalized with PFPA-disulfide **1** (Au-PFPA) in $CDCl_3$ with TMS (δ 0.0 ppm).

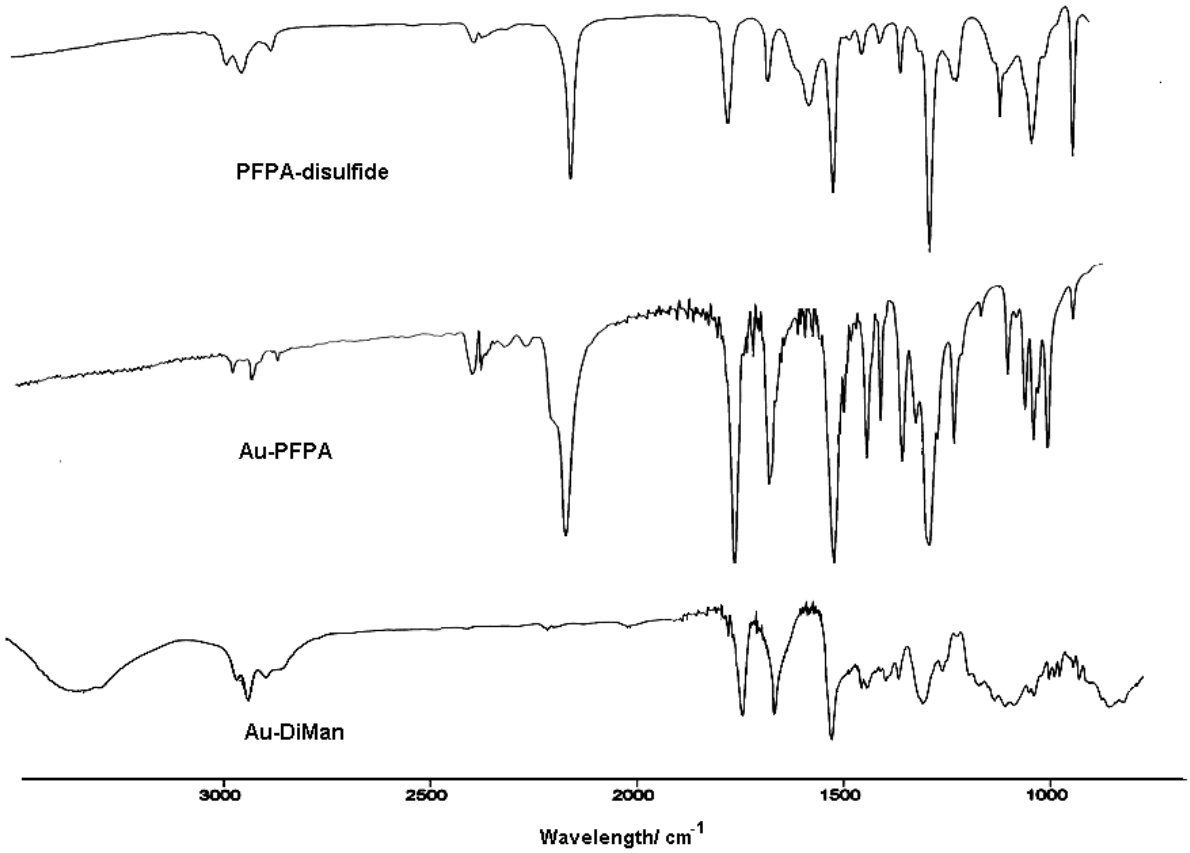

Figure 3S. FT-IR spectra of PFPA-disulfide **1**, gold nanoparticles functionalized with PFPA-disulfide **1** (Au-PFPA), and Au NPs subsequently coupled with α-1,4-mannobiose (Au-DiMan). The azide ($-N_3$) absorption at ~ 2125 cm^{-1} disappeared after light activation.

3. Calculation of D-mannose density on Au NP

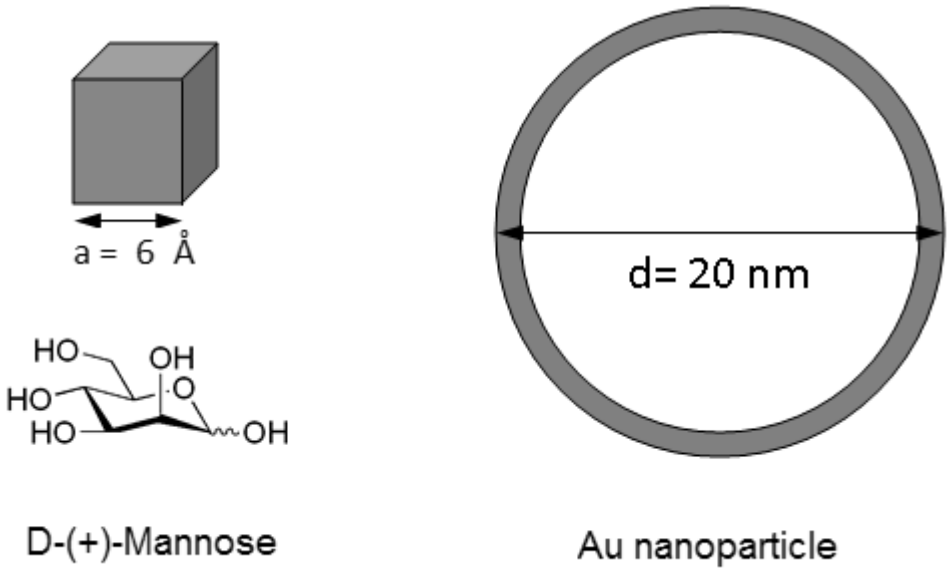

Figure 4S. D- mannose molecules and Au NPs

The maximal number of D-mannose molecules on each Au NP is calculated as follows.

Assuming that D-mannose occupies in space by taking the shape of a square, each side of the square is measured to be ~ 6Å by Chem 3D (CambridgeSoft., Ultra, version 9.0).
The D-mannose molecule is then projected to the surface, and the surface area of each D-mannose molecule is 36 $Å^2$.
The surface area of one 20-nm Au NP is 1.26×10^5 $Å^2$ ($= 4\pi \times 100^2$).
The maximal number of D-mannose molecules occupying the surface of one Au NP in a closely packed manner is 3.50×10^3 ($=1.26 \times 10^5$ $Å^2/36$ $Å^2$), corresponding to 5.81×10^{-12} nmol [$=3.50 \times 10^3 /(6.02 \times 10^{23}) \times 10^9$].

Assuming that the density of Au NPs equals to that of gold (19.3 g/cm^3), the weight of each 20-nm Au NP is 8.08×10^{-14} mg ($=19.3 \times (4/3\ \pi \times 10^3) \times 10^{-21} \times 10^3$).
The number of Au NPs in 1 mg of Au NPs is 1.24×10^{13} ($=1/8.08 \times 10^{-14}$), which is equivalent to 0.0206 nmol ($=1.24 \times 10^{13} /(6.02 \times 10^{23}) \times 10^9$)
The theoretical maximal amount (mole) of D-mannose on 1 mg Au NP is 72.0 nmol ($=5.81 \times 10^{-12} \times (1.24 \times 10^{13})$).

The D-mannose density of Au NP coated was measured to 24.1 ± 1.7 nmol/mg Au NPs. Therefore, the number of D-mannose molecules on each 20-nm Au NP is ~1.17×10^3 ($=24.1/0.0206$).
The surface coverage, ie measured/theoretical, is 33.4% ($=1.17 \times 10^3 /(3.50 \times 10^3)$)

4. Control experiments

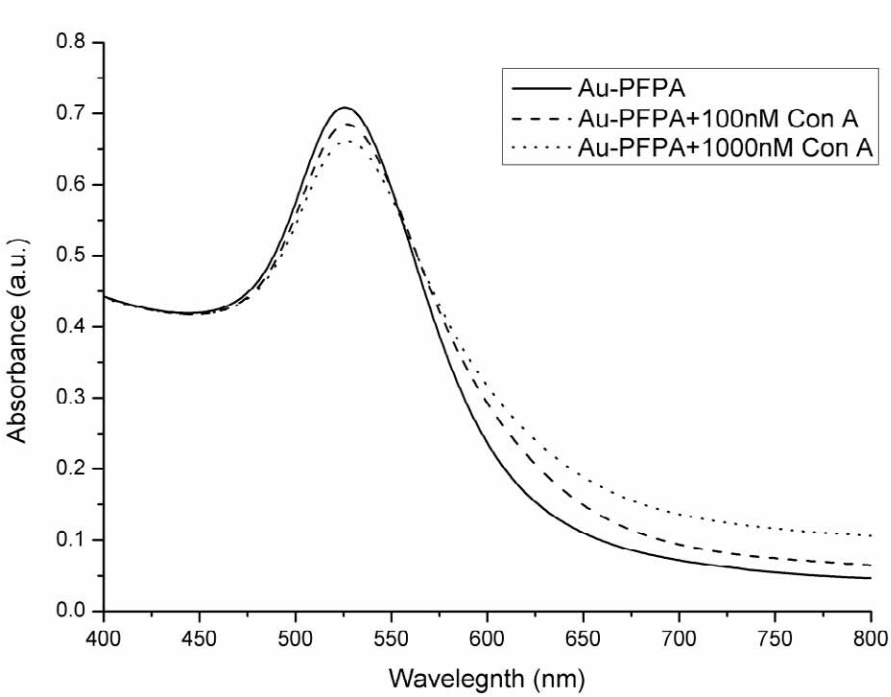

Figure 5S. UV-vis spectra of PFPA-functionalized Au NPs and after treating with 100 nM and 1000 nM Con A.