Electronic Supplementary Material (ESI) for RSC Advances.

Supplementary materials

A universal strategy for direct immobilization of intact bioactivity-conserved carbohydrates on gold nanoparticles

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Fig S1

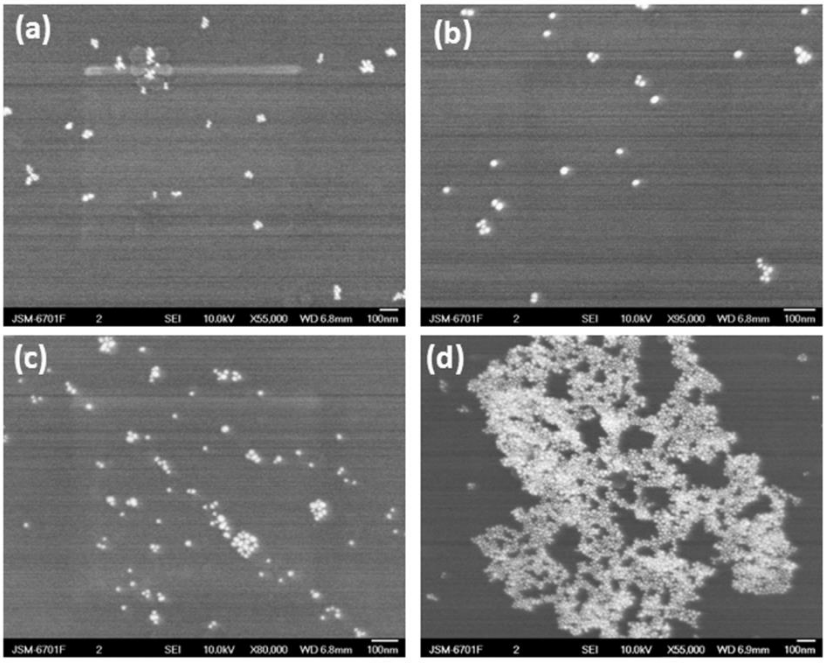

Fig. S1 The preparation process for immobilization of intact carbohydrates on GNP was characterized by SEM, with (A), (B), (C) and (D) corresponding to GNP-Tween 20, GNP-MUOH/MUA, GNP-mannose and GNP-mannose interacted with 100 nM Con A respectively; the error bar was 100 nm.

Fig S2

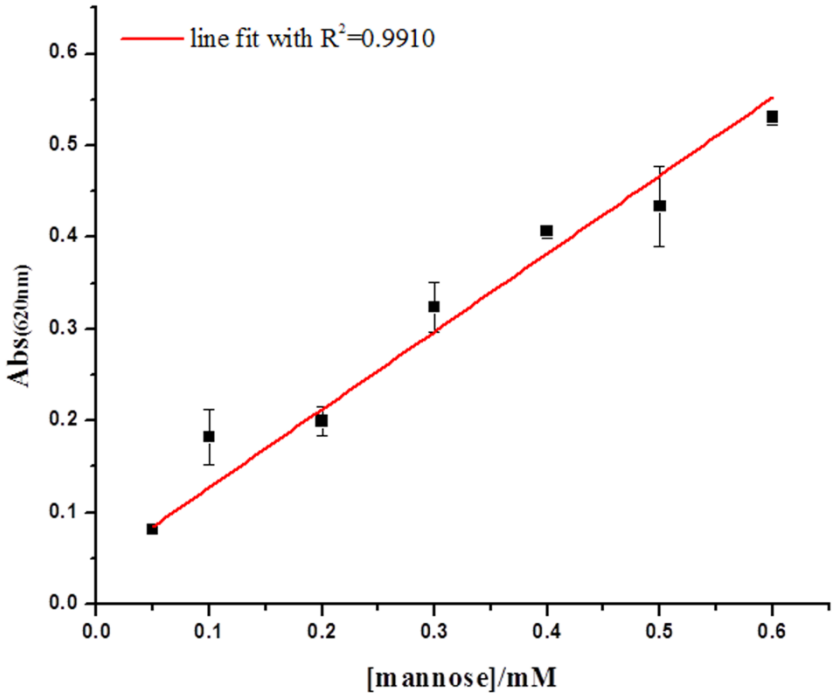

Fig. S2 A standard concentration curve of mannose obtained by colorimetry anthrone/sulfuric acid method. The concentration of mannose is 0.05, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6 mM, and the absorption at 620 nm was recorded.

Calculation of D-mannose density on GNP

First, assuming that mannose molecule takes on a cube structure, each side is 6 Å (CambridgeSoft., Ultra, version 9.0). When mannose molecules are tightly packed on the surface of gold nanoparticles, the maximal number of mannose molecules on one gold nanoparticle is 1.47 $\times 10^3$ (= 5.31 $\times 10^4$ Å^2 / 36 Å^2, i.e. the surface area of one 13 nm GNP divided by that of each mannose molecule), corresponding to 2.44 $\times 10^{-12}$ nmol.

In the actual experiments of immobilization of mannose on gold nanoparticles, the mannose concentration is 55 mM before reaction, and 54.99013 mM after reaction through anthrone/sulfuric acid experiment. The change of the mannose concentration is ΔC = 0.00987 mM in the reaction process, so the number of immobilized mannose molecules is 5.94174 $\times 10^{18}$ in terms of unit volume.

The concentration of gold nanoparticles is measured to be 15.42 nM. Therefore, the number of gold nanoparticles is 9.28 $\times 10^{15}$ (= 15.42 $\times$ 6.02 $\times 10^{23}$ $\times 10^{-9}$) per unit volume. So the number of combined with the mannose molecules immobilized on each gold nanoparticle is 0.64 $\times 10^3$ (= 5.94174 $\times 10^{18}$ / 9.28 $\times 10^{15}$). Compared with the theoretical calculation results (1.47 $\times 10^3$), the surface coverage, i.e. measured/theoretical, is 43.54% (= 0.64 $\times 10^3$ / 1.47 $\times 10^3$ $\times$ 100 %).