

# Colloidal Gold-Collagen Protein Core-Shell Nanoconjugate: One-Step Biomimetic Synthesis, Layer-by-Layer Assembled Film and Controlled Cell Growth

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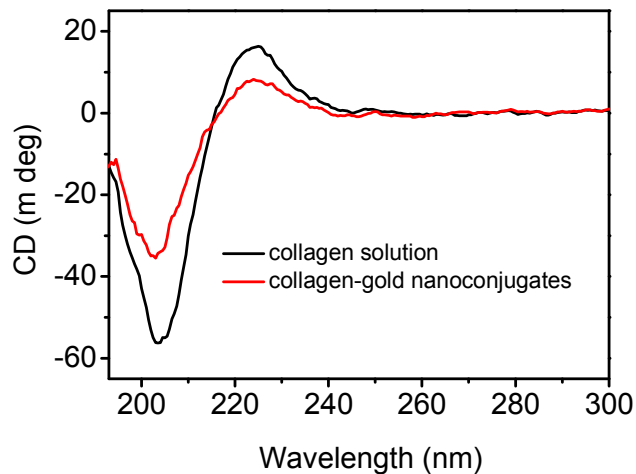
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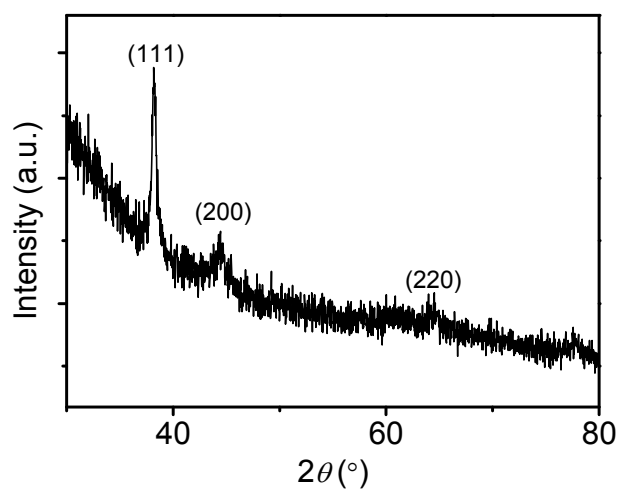
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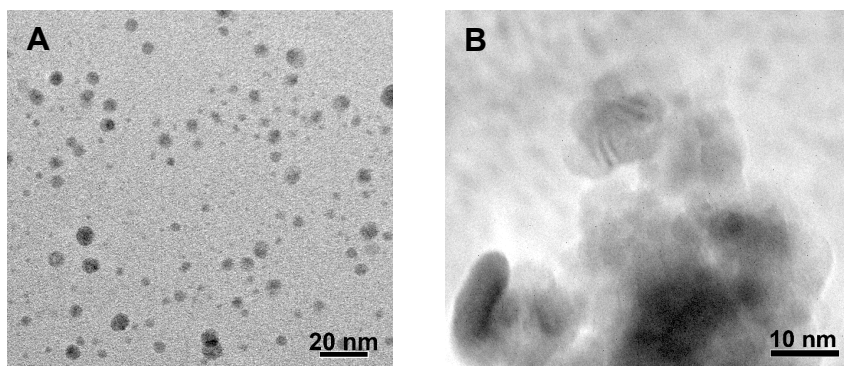
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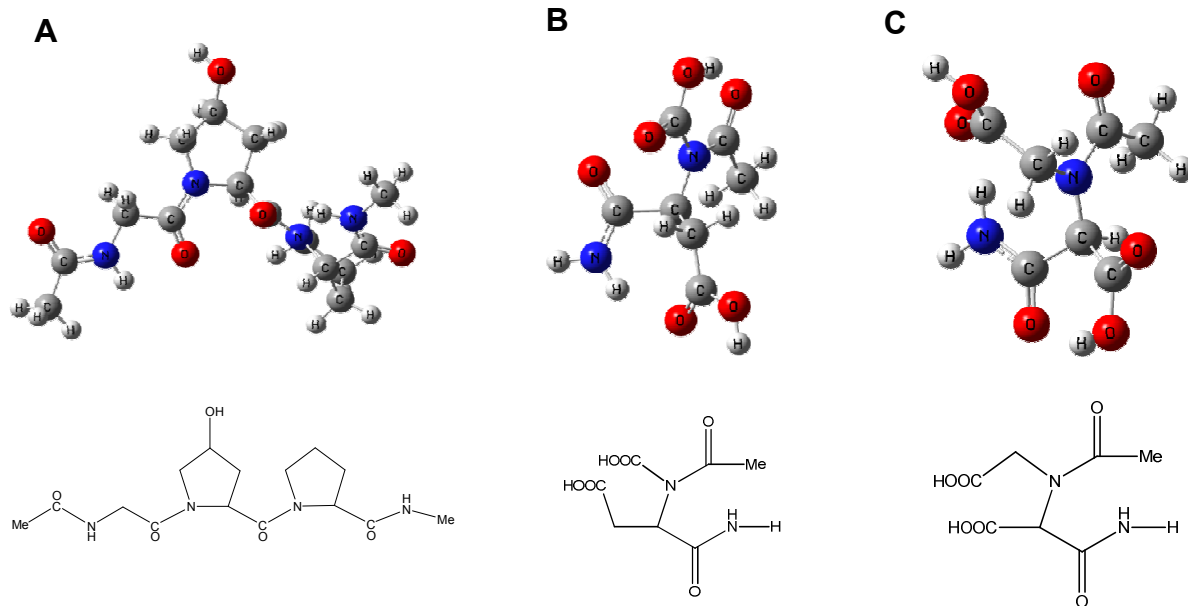
**Figure S1.** Circular dichroism spectrum of the collagen solution and the collagen-gold nanoconjugates, respectively. The collagen solution shows a strongly split Cotton effect with negative and positive signals at 205 and 225 nm, respectively, corresponding to the triple-helical structures of self-assembling collagen fibers.<sup>[1,2]</sup> The CD spectrum of collagen after reaction is consistent to that of collagen before reaction, implying that AuNPs formation has a negligible influence on the secondary structures of collagen.



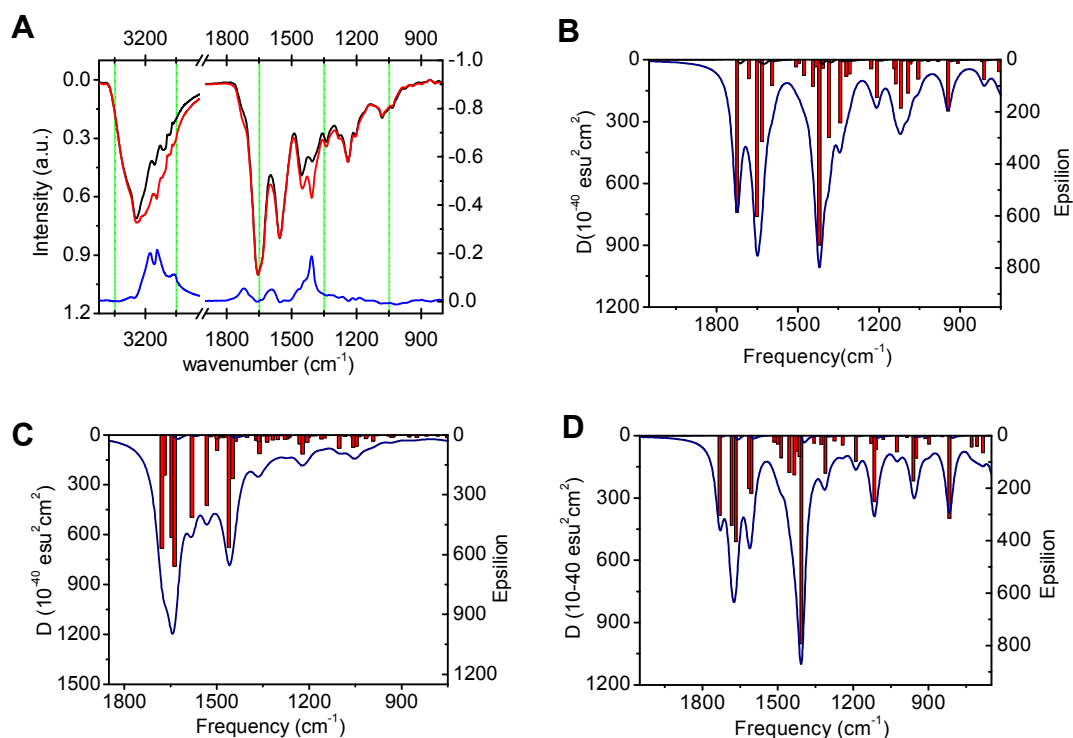
**Figure S2.** X-ray diffraction patterns of the collagen-gold nanoconjugates, indicating the formation of crystalline AuNPs.



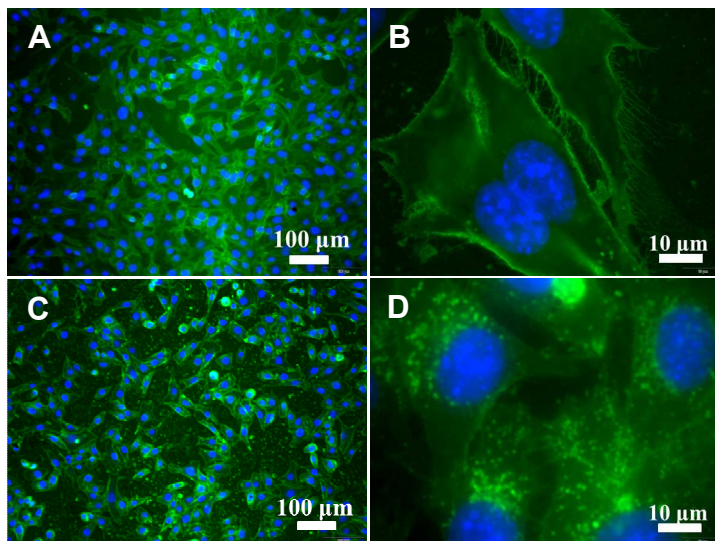
**Figure S3.** TEM images of Ag (a) and Pt (b) nanoparticles synthesized by using collagen proteins through the one-step strategy.



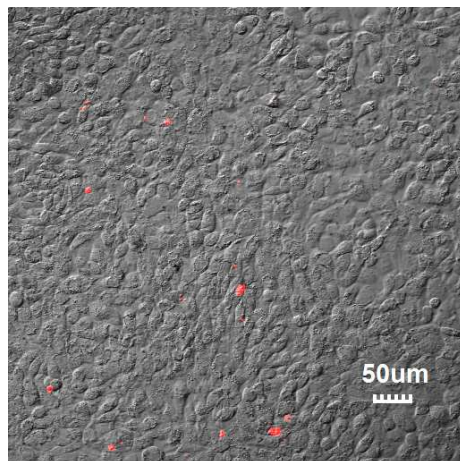
**Figure S4.** The molecular structure models of a minimal repeated motif of collagen (A) and possible products (B and C) after formation of gold nanoparticles.



**Figure S5.** Optimization of the molecular structures and vibrational analysis. (A) Experimental IR spectrum before (black curve) and after (red curve) the reaction, in which blue curve shows the difference in the IR spectrum before and after the reaction. The simulated IR spectral analysis of the GLY-HYP-HYP tripeptide before the reaction (B) and the products after the reaction (C, D).



**Figure S6.** Fluorescence microscopic images of 3T3 cells after 18 h of incubation on a (gold-collagen nanoconjugates/PLL)<sub>6</sub> film (A, B) and a (collagen/PLL)<sub>6</sub> film (C, D) at lower and higher (B, D) magnification, respectively .



**Figure S7.** Merged confocal image of NIH-3T3 cells stained by Proidium Iodide (a cell nucleus staining agent, indicative of cell apoptosis) after 48 h of incubation on the (gold-collagen nanoconjugates/PLL)<sub>6</sub> film, showing rather less cell death.

## References

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2. Toumadje, A.; Johnson, W. C. Systemin Has the Characteristics of a Poly(L-proline) II Type Helix. *J. Am. Chem. Soc.* **1995**, 117 (26), 7023–7024.