Gold Nanoparticles Conjugated with Folic Acid using Mercaptohexanol as the Linker


Departments of Bioengineering, University of Illinois at Chicago, Chicago, USA
(* Corresponding author email: mansoori@uic.edu

Abstract
Nano-conjugation (also known as nano-coupling) is one of the important procedures to build nanotechnology platforms. We have designed a new nano-conjugate made of folic acid and gold nanoparticle (AuNP). This nano-conjugate has application for selective targeting of the folate receptor that is overexpressed on the surface of tumor cells. For this purpose, we conjugated 6-mercapto-1-hexanol, as a bifunctional linker, to folic acid through its (–OH) group with a (-O-CO-) linkage formation. Then, we made new (-SH) terminated product to react with HAuCl₄ in the presence of sodium borohydride and it was bound to the AuNP surface through its thiol group.

![Chemical Structure](image)

Finally, we evaluated the specific interaction between the folic acid and AuNP by the corresponding observed characteristic bands in the ultraviolet-visible (UV-vis) and Fourier transform infrared spectroscopy (FTIR) spectra. Transmission electron microscopic (TEM) images reveal the spherical AuNPs formation induced by the bifunctional linker. For such a new synthesized nanoconjugate, metallic peso-cubic structure (alpha=beta=gamma=90°) with lattice constants of a=1.348 nm, b=1.348 nm, and c=0.725 nm and (110), (011), (221), (321), (060), and (004) crystal planes were confirmed through powder X-ray diffraction. We estimated the average size of the conjugated nanoparticles to be about 3 nm by TEM. The Elemental analysis and atomic absorption showed around 70 % organic molecules on the surface of AuNPs. The procedure presented in this report may be applied to a variety of conjugations of interest in nanoscience and nanotechnology.

Keywords: 6-mercaptop-1-hexano, Cancer Cell Targeting, Conjugated Nanoparticle, Folate, Folate Receptor, Folic Acid, Gold Nanoparticle, Nano-Conjugation, Nanotechnology

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