Ultrasmall covalently functionalized gold nanoparticles for protein targeting

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Ultrasmall gold nanoparticles have been the subject of intense research during the past two decades. Gold particles in this size range (< 2 nm) show excellent properties in cell-membrane penetration [1] and are biologically inert. Therefore, they offer an attractive opportunity to address proteins in a living organism without causing too much harm. They consist of a crystalline gold core and an organic shell.

After covalent functionalization with a dye, the particles can easily be localized in the cell. This is important to draw conclusions about their behavior and possible functions inside a cell. The nanoparticles can also be functionalized with supramolecular binders like molecular tweezers [2] to address positively charged amino acids like lysine or arginine in a protein.

Here we present a synthetic approach where batches of up to 50 mg of gold-glutathione (GSH) nanoparticles are prepared, followed by an azidation of the amino group of the GSH ligand to allow further covalent functionalization of the azide by a copper-catalyzed azide-alkyne cycloaddition (CuAAC) [3].

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