The influences of spheres and rod-like shape gold nanoparticles on the fluorescence emission of bio-molecules

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It is well known that in the presence of various shape noble metal nanoparticles, the fluorescence emission signal can be amplified, phenomenon named metal-enhanced fluorescence (MEF), effect due to the plasmonic characteristics of nanoparticles, which lead to a far-field radiation contribution to the total extinction. On contrary, there are some cases where fluorescence intensity is reduced by the influence of nanoparticles on the fluorophore, with the existence of several possibilities: the formation of a non-fluorescent complex between the fluorophore and the nanoparticles, the distance between the fluorophore and the nanoparticles, the inner-filter effect and so on. In this study, steady-state fluorescence measurements are performed, in solutions that contain various concentrations of gold nanoparticles. As fluorescent probe, I have chosen a protein (hemoglobin), that fluoresce due to its constituent aminoacids (mainly tryptophan), when excited with UV light. Discussions could be made concerning the evolution of hemoglobin fluorescence in the presence of round shape nanoparticles and rod-like ones. In order to evidence that gold nanorods can either amplify or reduce the fluorescence intensity of a fluorophore, I used as counterexample dopamine hydrochloride molecule as fluorophore.