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FLUORESCENCE QUENCHING OF CYP4F11 PROTEIN BY GOLD FOIL IN RAMAN SPECTRA

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The gold substrate (gold foil) quenches the fluorescence of the protein and this enhances the Raman signal from the protein by approximately 10-20 times, without affecting its structure, which could be used in clearing up the protein structure after modification under different processes in the cell as oxidation, hydroxylation, etc. In the case of Surface-Enhanced Raman Spectroscopy (SERS), it was not possible before due to non- successful application of conventional SERS supports for biopolymers with many sites of interaction with SERS support and/or in the case of successful application due to drastic signal enhancement leading to disturbance of Raman spectra in SERS spectrum. Human CYP4F11 monoxygenase with fine structure changes after different enzyme modifications were applied now as a model protein for the method development. The fluorescence quenching process of molecules by a metal surface is a well-known process that depends on the distance between molecules and metal [1] and in the case when a protein is surrounded by buffer molecules or/and another protein molecule this process is more probable than desired enhancement. When fluorophores are placed at suitable distances from metallic particles or surfaces, fluorophores can undergo modifications of their radiative decay rates in the metal presence, Γm, where an increase in Γm results in an increase in fluorescence intensity and reduction in lifetime, which is converse to the free-space condition in which both change in unison. The last point to-gether with a concentrated incident electrical field by metal is one of the reasons of signal enhancement in the fluorescent mode. The quantum yield of a fluorophore shows a competition between radiative decay and non-radiative processes. In our case of thin gold foil deposited on quarts substrate, non-radiative process is dominant and as a result the fluorescence quenching of protein lead to appearance of a better Raman signal without disturbance and its enhancement in comparison with the same of quarts substrate.

[1] J.R Lakowicz, *Analyst*, **10** (2008) 1308.