Monitoring of Intracellular Environment by SERS and Fluorescence

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Surface-enhanced Raman spectroscopy (SERS) has dynamically developed, especially in the field of bioanalysis, such as studying of cells, because of its ultrasensitive detection limits [1]. As the native constituents are present in cells at very low concentrations, it is challenging to find a method, which can be easily applicable for the cellular studies. However, it is possible to collect informative signals at cellular level within seconds with SERS spectroscopy. To carry out SERS experiment on the cells, it is crucial to synthesize appropriate SERS labels i.e. metal nanoparticles conjugated to Raman reporters (mainly dyes with a large cross section for Raman scattering). These nanoparticles can be introduced into the cells to give information about intracellular environment along with SERS signal of a reporter [2]. Fluorescence is the most common reference method for the analysis of cells, however, most fluorescent organic dyes exhibit relatively weak emission intensity and they are rapidly photobleached. From this reason, combining fluorescence with SERS of higher spatial resolution than fluorescence provides a powerful tool for detailed studies on cells.

The uptake of different specimens by cells is related to the cellular membrane properties, which can be changed in pathological states. Thus, it is important to examine the kinetics of the fluid phase uptake under different conditions in order to broaden knowledge about this process. Here we present the SERS and fluorescence studies of fluid phase uptake in different cells, e.g., macrophages and human endothelial cells EA.hy926.

References:

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