Raman spectroscopy as a prospective tool in cancer research

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In the last years Raman spectroscopy has emerged as a powerful tool for the analysis of isolated molecules, single cells or even tissue. By means of in-vivo spectroscopy information about the cell components can be gained and even living cells can be analysed without destruction. With the aid of micro-Raman spectroscopy it is possible to resolve textures up to the submicron range and to record Raman spectra within such a spatial resolution.

Raman spectra of biological samples like cells or tissues are superpositions of the molecular information from all components within the laser focus. Therefore, special techniques to properly analyze the data e.g. with statistical / chemometrical methods are necessary. [1] Furthermore, since Raman images are hyperspectral images i.e. consist of complete Raman spectra at each pixel data reduction by multivariate statistics is required to obtain data sets of manageable numbers of chemically significant descriptors for generating the image contrast.

In this contribution we describe some of our latest results concerning the application of micro-Raman spectroscopy in combination with innovative chemometric methods to characterize cancer cell lines and tissues. Since even minor variations in cell chemistry during pathogenesis can be monitored by means of Raman spectroscopy this information is used to characterize and distinguish different cancer cell lines. [2-4] In addition, the knowledge of the mode of action of cytostatic drugs might lead to the development of novel therapeutic approaches including the design of more effective and specific drugs.

References: