

Comparison of different measurement techniques for IR-spectroscopic characterisation of microorganisms

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The fast and accurate analysis of microorganisms is more in demand today than ever before. Especially, in medical sciences appropriate novel efficient methods are needed [1, 2], because of the essential identification of multi-resistant germs and contagious pathogens, which must be seen in conjunction with an increasingly mobile world population. Spectra of dry-films of *Pseudomonas fluorescens*, which were recorded with a fiber-optic ATR-probe equipped with a diamond micro-prism, were compared with spectra recorded in transmission on CaF₂- and ZnSe-windows, as well as on PE-foils. For preparation of these studies, a characterisation of the materials was performed. Here, the polymer foils are certainly more cost effective than the window materials studied. Furthermore, ATR-spectra of *Pseudomonas putida*, *Bacillus subtilis*, *Micrococcus luteus*, *Escherichia coli* as well as spectra of the green algae *Chlorella sorokinia* were recorded for the compilation of a first spectral library. A dendrogram was calculated from hierarchical cluster analysis, showing the spectral distances between the individual microorganisms using the carbohydrate specific interval of 1200 – 900 cm⁻¹. At last, a comparison between spectra of bacteria measured with the ATR-technique and spectra measured with dried bacteria on ZnSe-windows, which were provided by the Robert Koch-Institute in Berlin, was performed. Beside investigations on the spectral reproducibility, the influence of storage with down freezing and warming-up on the bacterial mass and of different nutrient agars on the spectra of *Escherichia coli* and *Bacillus subtilis* was also tested. Measurements with the ATR-probe delivered spectra in excellent quality. Spectra recorded with this technique can be compared quite well with conventional transmission measurements after taking into account the ATR-specific wavelength penetration depth of the probing radiation. The detection limit with spectra recorded using the ATR-probe under the chosen conditions was less than 1 µg of dry mass.

References

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