

Infrared transmission spectrometry for the determination of urea in micro-liter sample volumes of blood plasma dialysates

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Abstract

Application of mid-infrared spectroscopy for the determination of urea in blood plasma dialysates of micro-liter sample volumes using a transmission micro-cell was investigated. Infrared spectra of the dialysates of plasma samples collected from 75 different patients using CMA 60 microdialysis catheters were evaluated with multivariate partial least squares regression. Using the absorbance spectral data from $1520 - 1420 \text{ cm}^{-1}$ and $1220 - 1120 \text{ cm}^{-1}$, a minimum standard error of prediction (SEP) of 0.88 mg/dL (0.14 mM) was achieved with spectral variable selection. Our findings suggest the feasibility of developing a mid-infrared sensor in combination with micro-fluidics for online monitoring of urea in patients undergoing dialysis treatment.

Index Headings: Dialysis; urea; mid-infrared spectroscopy; partial least squares regression; spectral variable selection.