Development of new photoacoustic signal generation theory for *in situ* concentration profiling on permeant/membrane system

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Microporous molecular sieve membranes have potential to revolutionize several industrially important separations. Considerable research has hence been aimed at membrane composition (including guest molecule concentration) and transport properties as a function of depth. The study of membrane transport phenomena depends heavily on theoretical models (e.g., the Maxwell-Stefan equations). We are developing non-destructive, in situ methods based on photoacoustic spectroscopy to probe the depth dependence of membrane composition.

Here we present an new photoacoustic signal generation theory, to apply the non-destructive concentration profiling of molecular sieve membranes. In particular, we have applied the new theory on step-scan photoacoustic spectroscopy (SS-PAS) to depth-profile MFI zeolite membranes. The new photoacoustic theory is useful to monitor depth-profiles during in situ measurements. The monitored depth-profile is continuous and quantitative. In addition, the positions of the layer interfaces and the layer thicknesses are obtained.