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Quartz-enhanced photoacoustic spectroscopy with electrical co-excitation

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Photoacoustic spectroscopy relies on the temporally modulated energy input into a gas via absorption and the subsequent transfer into a sound wave that is measured. This transfer of energy from vibrational into translational modes is highly dependent on collision partners and linked relaxation rates. For quartz-enhanced spectroscopy (QEPAS) a micro-tuning fork is used as a transducer instead of a conventional microphone and the modulation of the excitation laser is done at the resonant frequency of the tuning fork for signal enhancement. However, it is not only possible to drive the tuning fork into oscillation by the photoacoustically generated acoustic wave but also by applying a modulated voltage. With these two different driving forces, either applied simultaneously or subsequently, it is possible to gain more insight of the properties of the gas and the relaxation dynamics. This is especially valuable if the background gas and with it the collision partners, density, velocity of sound and relaxation rates change and a variation in signal cannot unambiguously attributed to a variation in concentration. It will be discussed how the photoacoustic interaction can be used to promote an originally electrically induced tuning fork oscillation or to fasten its fading, which enables the measurement of times rather than intensities.

Biography

Ulrike Willer has studied Physics at Christian-Albrechts University in Kiel and completed her PhD in the year 2001 at Clausthal University of Technology, Germany. She is Researcher at the Energy Research Center and Clausthal University of Technology. She has published more than 45 papers in reputed journals and has been serving as Progam Comittee Member for different scientific conferences. Her main research interest focuses on mid-infrared spectroscopy, photoacoustics and sensor design.

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