ULTRASENSITIVE DUAL-BEAM ABSORPTION SPECTROSCOPY, BASED ON WAVELENGTH-MODULATION TECHNIQUE AND LOGARITHMIC NOISE CANCELING

Yu. KURITSYN and V. LIGUER, *Institute of Spectroscopy, Russian Academy of Science, 142092 Troitsk Moscow Region, Russia.*

Various registration methods for ultrasensitive diode laser based absorption spectroscopy are discussed. The sensitivity of a single-beam wavelength modulation technique is limited by excess laser noises and wavelength-dependent effects in optical system. A dual-beam logarithmic detection allows to reduce excess laser noises but actually shot-noise level is not usually achieved and sensitivity is limited by low-frequency transmittance fluctuations and a flicker noise from atomizer. Simultaneous using a double-beam logarithmic detection and a wavelength-modulation technique allows to minimize a low-frequency noise contribution. Absorbance of $7\times10^{-8}/(\mathrm{Hz})^{-1/2}$ in such a system is demonstrated. Applications to trace measurements of chlorine in glow-discharge atomizer and lithium in graphite tube atomizer are described.

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