Transient Grating Signals from Particulate Suspensions

C. Frez and G.J. Diebold[C,S]
Department of Chemistry, Brown University, Providence, RI, U.S.A.
Gerald_Diebold@Brown.edu

Photoacoustic waveforms give information on the temporal and spatial deposition of optically deposited heat for an irradiated body surrounded by a transparent fluid. For certain cases, the geometry, the sound speed, and the density of a weakly absorbing body can be determined by inversion of a recording of photoacoustic pressure versus time. For objects whose dimensions are on the order of hundreds of microns or larger, the amplitude of the photoacoustic wave is sufficiently large that it can be recorded by a fast transducer; however, for smaller sized bodies, the small amplitude of the signal precludes measurements using conventional transducers. Here, we show how signals calculated from single particles can be used to determine the diffracted light signal in a transient grating experiment. The method involves computation of the thermal and acoustic modes of wave motion in the grating separately. Experiments are reported on particle suspensions and compared with the results of the theoretical method.