

Theoretical Study of CO₂, CO, O₂, H₂O, and CH₄ Near-Infrared Absorption Spectra

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Abstract

Diode-laser based absorption spectroscopy can provide non-intrusive, absolute measurements of multiple flow parameters. An accurate prediction of absorption spectra is required for extracting species concentrations and temperature in combustion gases using a diode-laser based absorption spectroscopy. High-resolution absorption spectra of CO₂, CO, O₂, H₂O, and CH₄ in the near-infrared (IR) region are theoretically studied. The calculated spectra are compared with reported experimental data under various temperature and pressure conditions. Results demonstrate that the present simulations excellently reproduce the measured spectra, and the developed numerical models can be used for future combustion emission measurements.

Keyword : Absorption spectroscopy, Line strength, Collisional broadening, Voigt function