Tunable Diode Laser Absorption Spectroscopy in a Supersonic Steam Jet

Ahmed Al-Manea[1, 2], David Buttsworth[1], John Leis[1], and Khalid Saleh[1]
[1]School of Mechanical & Electrical Engineering, University of Southern Queensland, Toowoomba, Qld 4350, AUSTRALIA
[2]Al-Samawah Technical Institute, Al-Furat Al-Awsat Technical University, Al-Samawah, 66001, IRAQ
ahmed.al-manea@usq.edu.au

ABSTRACT

Turbulent mixing of multi-phase compressible jets formed within steam ejectors requires further investigation so that reliable models can be developed to aid the ejector design process. Tunable Diode Laser Absorption Spectroscopy (TDLAS) was applied to measure properties in a supersonic steam jet formed downstream from an ejector nozzle. A low-speed flow of dry nitrogen surrounded the steam jet to provide a non-absorbing co-flowing stream that enabled the water vapour absorption to dominate the line-of-sight measurements. Combining the experimental data from the laser absorption with theoretical models using the Abel inversion method, an estimation of the radial distribution of pressure, temperature, and concentration of water vapour in the flow were obtained.