Contribution ID: **117** Type: **Poster**

M2Po3B-02: Design and uncertainty analysis of cryogenic spectral emissivity measurement system

Tuesday 20 May 2025 14:00 (2 hours)

Radiation heat transfer is a crucial mode of heat transfer in vacuum as well as cryogenic environments. However, there is no optimal solution to accurately measuring spectral emissivity over a wide temperature range, especially at cryogenic temperatures. This work designed a cryogenic spectral emissivity measurement system based on radiometric methods, aiming to measure the spectral emissivity of various materials in the temperature range of 100 K to 200 K with a G-M cryocooler. The current work emphasized analyses and discussions on how various components change at cryogenic temperatures and the effectiveness of the mirror combination for collecting radiation beams before the use of the Fourier Transform Infrared (FTIR) spectrometers. The study simulated the overall distribution of the cryogenic temperature field, and then evaluated the influence of thermal contraction on the optical path and computed a comprehensive Type B uncertainty of 3.1672% for the modulation regime. This work can serve as a validation of various sources of errors in preparation of experimental setups.

Authors: HUANG, Zichun (Technical Institute of Physics and Chemistry); LI, Bixi (Technical Institute of Physics and Chemistry); Dr ZHANG, Hao (Technical Institute of Physics and Chemistry, CAS); ZHANG, Hengcheng (Technical Institute of Physics and Chemistry, Chinese Academy o); XIE, Liancheng; SHEN, Fuzhi

Presenter: HUANG, Zichun (Technical Institute of Physics and Chemistry)

Session Classification: M2Po3B - Cryogenic Testing, Standards, Procedures, and Measurements