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Absorption Characteristic of LNG as A Function of IR Wavelength

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Abstract

Prediction of thermal hazard distances arising from pool fires have been modeled with semi-empirical and field models which have as a major constraint the limited range in which they were validated and the uncertainty introduced by unstudied phenomenon observed in large scale experiments. Previous works have reported an overestimation of the mass evaporation rate when using calorimeters on the pool surface to measure the heat feedback from the fire when the driving force for the evaporation of LNG is the radiant heat. This heat was assumed to be absorbed entirely by the liquid pool and used as latent heat. Comparison to the direct measurements made of mass burning rates in the same experiment showed that an overestimation of a factor of almost 2.5 was introduced in the calculation of the thermal radiation output to the surroundings. Absorption, scattering and reflection phenomena occurring at the pool surface either by gas, liquid or soot encompass the reasons proposed to explain this discrepancy. Due to this, it is important to accurately quantify the thermal radiation from fires and to study the physical phenomenon of the overestimation of the mass evaporation rate. The aim of this current research is to determine the absorption characteristics of natural gas in liquid state at cryogenic temperatures by the variation of IR wavelength. To accomplish this, a cryostat containing the sample will be used in conjunction with a spectrometer to obtain the radiant energy distribution as a function of wavelength at different temperatures. This will allow for the formulation of the evaporation rate as a function of known parameters and further interpretation of the existing data where optical effects have a significant role in the mass evaporation rates in pool fires.