

GENERATION OF NEW WSGG CORRELATIONS AND ANALYSIS ON THE IMPORTANCE OF CONSIDERING TRANSPARENT WINDOWS FOR SOOT

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ABSTRACT. This work generates new weighted-sum-of-gray-gases (WSGG) correlations for soot based on the Rayleigh theory and the refractive index data from several authors, for wide ranges of temperature, path length, and soot volume fraction. New correlations are also developed for a more simplified methodology which considers that the spectral dependence of the soot absorption coefficient is linear. All these WSGG coefficients are compared to the high resolution solution for three test cases, both considering and neglecting the transparent window of soot. Results show that the correlations provide accurate prediction of total emittance, radiative heat flux, and radiative heat source for all the conditions considered in the present study. However, the inclusion of the transparent window contribution did not increase the accuracy of the method considerably. Since the computational cost of the WSGG method is increased when the transparent window is considered, this study concludes that neglecting it is the best option, at least for the presented correlations. Furthermore, it is also concluded that the WSGG is a good alternative to the spectral modeling of soot.