EFFECT OF DETAILED SOOT RADIATIVE PROPERTIES ON A LAMINAR COFLOW SOOTING FLAME

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In the present work, the effect of detailed soot radiative properties on a laminar ethylene-air diffusion jet flame at atmospheric pressure is investigated [1]. The gaseous phase is described by a tabulated chemistry method based on Radiative Flamelet Progress Variable model [2], which has been extended to take into account differential diffusion effects. Soot mechanisms are described by a sectional method [3] while PAHs from A1 to A7 are transported. The radiative heat transfer equation (RTE) is solved with a reciprocal Monte-Carlo method with spectral dependency of optical properties. For soot particles, several expressions of the optical index m are considered, and absorption, emission and scattering are taken into account. In the present work, the effect of soot and hot gases radiation is analysed by the means of a spectral analysis as shown Fig1. Hot gases are characterized by high amplitude peaks while soot spectrum is wide and continuous. The specific effect of absorption and emission properties in the radiative power field is also presented.

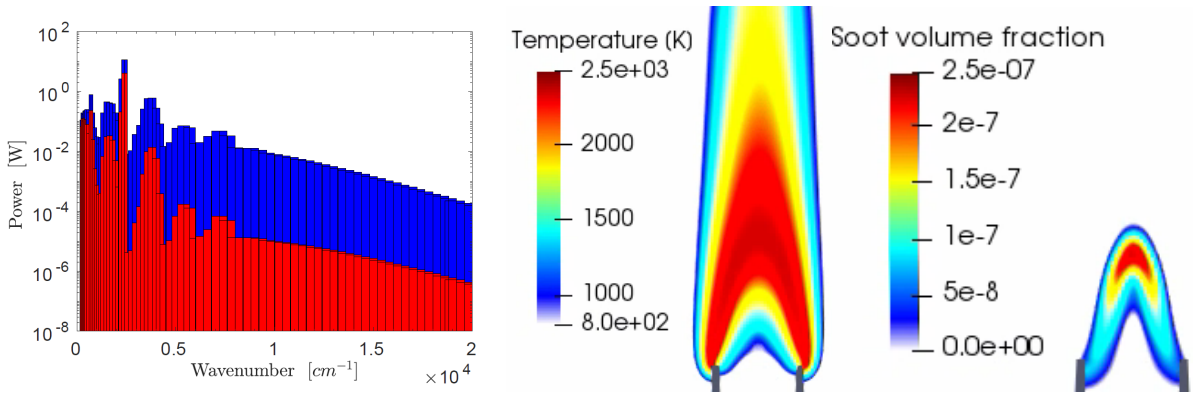

Figure 1 Comparison of radiative power spectrum emitted (blue) and absorbed (red) on a preliminary field (left), Temperature and soot volume fraction computed (center and right) from the preliminary simulation.

References

[1] – RJ. Santoro et al, Combustion Science and Technology, Vol. 53(2-3), 1987
[2] – M. Mueller, H.Pitsch, Physics of Fluids Vol. 20, 2008
[3]– P. Rodrigues et al. Proceedings of Combustion Institute Vol. 36(1), 2017.

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