Propulsion, Engines and Missiles » Combustion and Ignition

Wide Temperature Range Kinetics of Plume Reactions

Authors: Arthur Fontijn; RENSSELAER POLYTECHNIC INST TROY NY DEPT OF CHEMICAL ENGINEERING

Abstract: The kinetics of reactions leading to the CO Fourth Positive vacuum ultraviolet emission is studied for incorporation in plume radiation models. A fast-flow reactor and a high temperature, pseudo-static, photochemistry reactor have been used. Experiments with the former on the O + C2H2 reaction have shown that the intensity of the CO Triplet bands decreases with increasing pressure. This is in accord with the proposed mechanism for CO formation, by collision- induced curve crossing from CO triplet states. Experiments in the pseudo-static reactor have confirmed the increase of the CO **chemiluminescence** intensity with pressure, as indicated by this mechanism, but show a decrease in the intensity of the emission when the C2 + O2 reaction is investigated instead. This indicates a direct CO formation in the latter reaction, which leads to more intense vuv emission and may be a more important reaction for rocket exhausts. As the first step toward obtaining the absolute light intensities and **chemiluminescence** efficiencies for the C2 + 02 reaction, its vuv emission is used to obtain its overall rate coefficients, k(300-976 K) = 1.8X10EXP(-11)(exp- 451K/T) cm3/(molecule.s) These values are in excellent agreement with earlier experiments, where the C2 consumption rate coefficients were measured instead.

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