Abstract Submitted
for the GEC06 Meeting of
The American Physical Society

Model calculations of the "flame" in flowing-afterglow plasmas[1]

RAINER JOHNSEN, RICHARD ROSATI, MICHAEL GOLDE, University of Pittsburgh — Our recent experience in analyzing optical emission from flowing-afterglow plasmas has led us to re-examine some of the simplifying assumptions that are often made in such experiments. One is often forced to carry out observations in the first few centimeters downstream from the reagent inlet, a region in which the reagent gas distribution is highly non-uniform. In this region, the "flame", i.e., optical emission that arise from reactions of active particles (ions, metastables etc) with reagent molecules, actually is hollow, roughly cone-shaped region, the center of which is essentially dark, while a cursory visual inspection gives the appearance of a solid luminous cone. This occurs for both ring-shaped and point-like gas inlets. If one were to measure the electron density immediately downstream from the reagent inlet, one would find a minimum on the flow tube axis, rather than a maximum. One would also find that a simple "bulk-flow" model seriously overestimates the rates at which some chemical reactions occur, because the reactions are limited by diffusion rather than by the chemical rates. We will present the results of model calculations and compare them to experimental observations of emission flames produced either by electron-ion recombination or metastable excitation.

[1]Supported by NASA

Rainer Johnsen
University of Pittsburgh

Date submitted: 12 Jun 2006 Electronic form version 1.4