Collisional-Radiative Kinetics in Monatomic Gases[1] HAI LE, ANN
KARAGOZIAN, University of California, Los Angeles — A detailed model of electronic excited states is essential in capturing all the nonequilibrium processes of a
partially ionized plasma by means of collisional and radiative interactions. This
collisional-radiative (CR) model allows us to consider deviations from equilibrium
distribution of the internal states, and is now more commonly used in the study of
plasma discharges. Prior studies by Kapper and Cambier[2] and Panesi et al.[3] suggest
that this level of detail is needed for an accurate prediction of the flow field, and it
is particularly relevant to plasma-combustion interactions. The required number of
excited states needed to be included in the CR model is often prohibitively large due
to the nonequilibrium condition of the plasma. The consequence is a large system
of ODE's which needs to be solved at each time step. A reduced mechanism for the
CR model can be attained by grouping the upper states of the atomic state distribution (ASDF) into a pseudo-level in which the population is characterized either by a
uniform distribution or a Boltzmann distribution. This talk presents both detailed
and reduced models for an ionizing shock in Argon.

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