

## Create Reduced Chemical Kinetic Mechanisms with

# CARM

(Computer Assisted Reduction Method)

### INTRODUCING CARM

**CARM** is a software package developed by Prof. J.-Y. Chen of U.C. Berkeley, that automatically creates reduced chemical kinetic mechanisms starting with a detailed mechanism and a set of input problems representing the conditions under which the mechanism is to be used.

### CAPABILITIES

**CARM** requires little human or cpu time to significantly reduce the number of species that must be accounted for in a reacting flow simulation.

The output of **CARM** is a FORTRAN subroutine that gives the chemical source terms for each species in the reduced mechanism as a function of the temperature, pressure and species mass fractions. This subroutine can be used in a CFD code, or in simpler applications such as those associated with the Chemkin<sup>®</sup> package (PSR, SENKIN, Oppdiff, etc.).

### REQUIRED INPUTS

**CARM** reads PSR solutions representing target conditions generated using the detailed mechanism that is to be reduced. These require a detailed mechanism and thermal file in Chemkin<sup>®</sup> format.

### REDUCTION TECHNIQUE

**CARM** uses the input test problems to rank species by the error introduced by assuming they are in steady state. The user then chooses which species to retain in the reduced mechanism. The output subroutine contains code that solves for the steady-state species in terms of those treated kinetically.

### REQUIRED HARDWARE

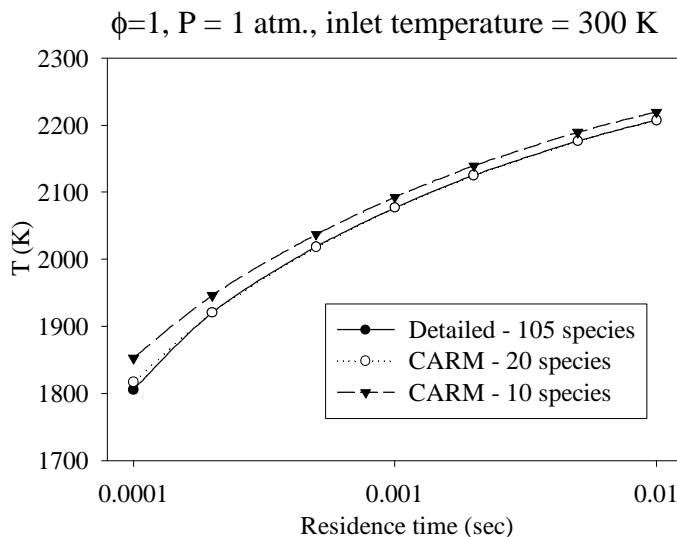
**CARM** can be used on PCs or UNIX workstations to reduce mechanisms containing hundreds of species and thousands of reactions in only seconds of cpu time.

### POTENTIAL APPLICATIONS

**CARM** opens the possibility of more realistic chemistry using fewer scalar variables in simulation of flames, gas turbines, IC engines, fires, explosives, process chemistry, or any reacting flow problem for which detailed chemistry is known.

### SAMPLE RESULTS

The figure below compares results of **CARM** and detailed chemistry for heptane/air PSR calculations. **CARM** gives excellent results with significantly fewer species than detailed chemistry.



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