

**AS – 568 High Temperature Gas Dynamics**  
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**Supplementary Exercise – 4**  
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1. Consider the mechanism for pure CO burning:

- (i)  $O_2 + O_2 \rightarrow O_2 + O + O$
- (ii)  $CO + O + M \rightarrow CO_2 + M$
- (iii)  $O + O + S \rightarrow O_2$  (surface)
- (iv)  $O_2 + O \rightarrow O + O + O$

Write the equations for solving the rate of change of [O] & [CO<sub>2</sub>] in the system. Go through the steps used in class with this set of reactions and find the expressions for finding the explosion limits at different temperatures.

2. Solve the reaction rate dependence on pressure for (i) low T, (ii) high T, with the data given below: (the numbers given in this table are fictitious, and are to be used only for this exercise, and are intended solely to give a feel for the kinetics)

Reaction	$A_k$ (mol,cm <sup>3</sup> ,s)	$m_k$ (T in K)	$E_k$ (cal/mol)
(i)	1.5e20	-1.5	118000
(ii)	1.8e17	0	2385
(iii)	3e17	0.5	0
(iv)	2.5e17	1	5000

3. Create an explosion limit curve for the system given in problem 3 for non-stoichiometric mixture and compare it with that for the stoichiometric mixture.

4. Read from books about “Cool Flames”. A Good read will be from the books by one of “Glassman” or “Warnatz” or “Lewis&VonElbe”.