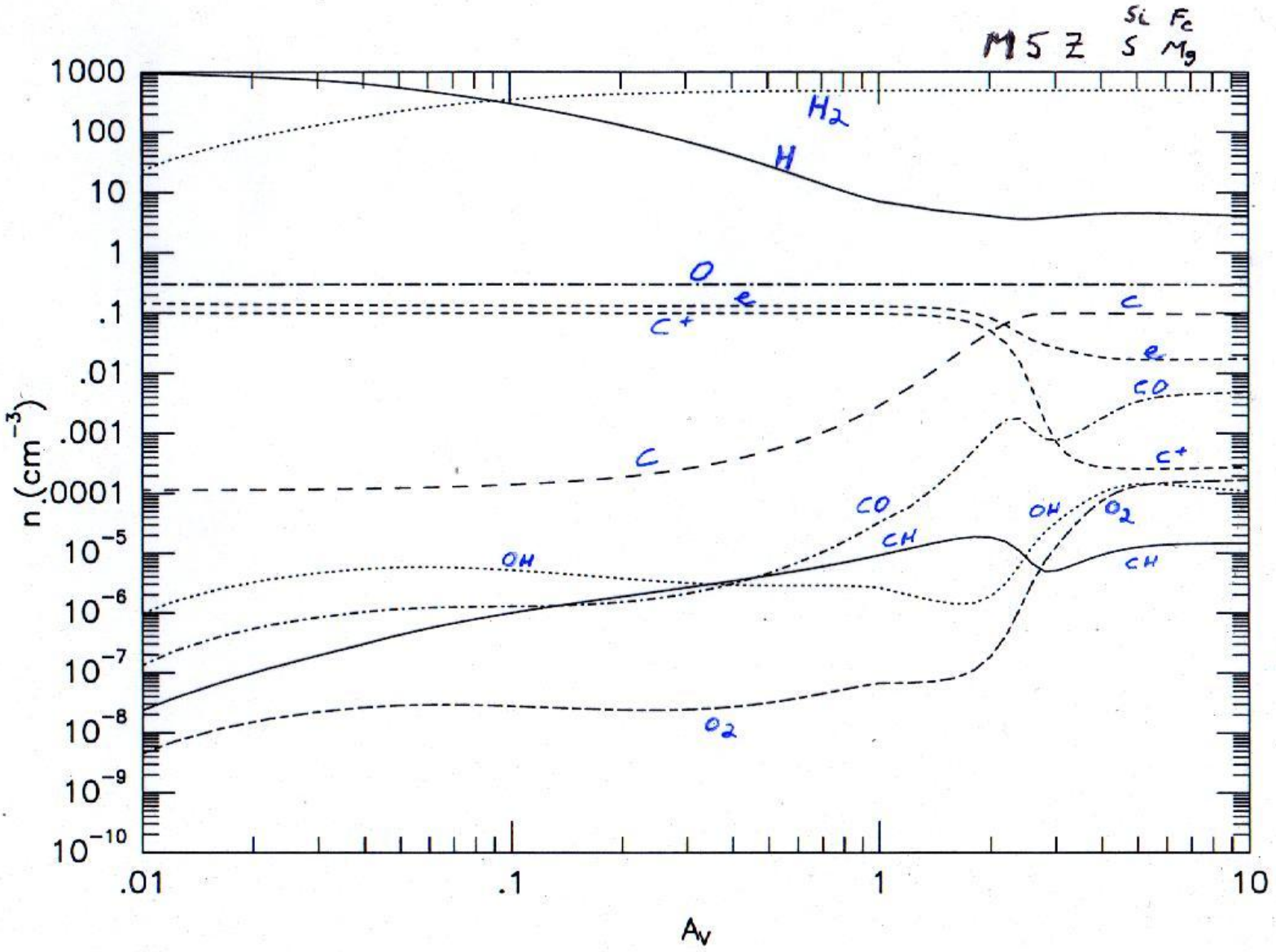
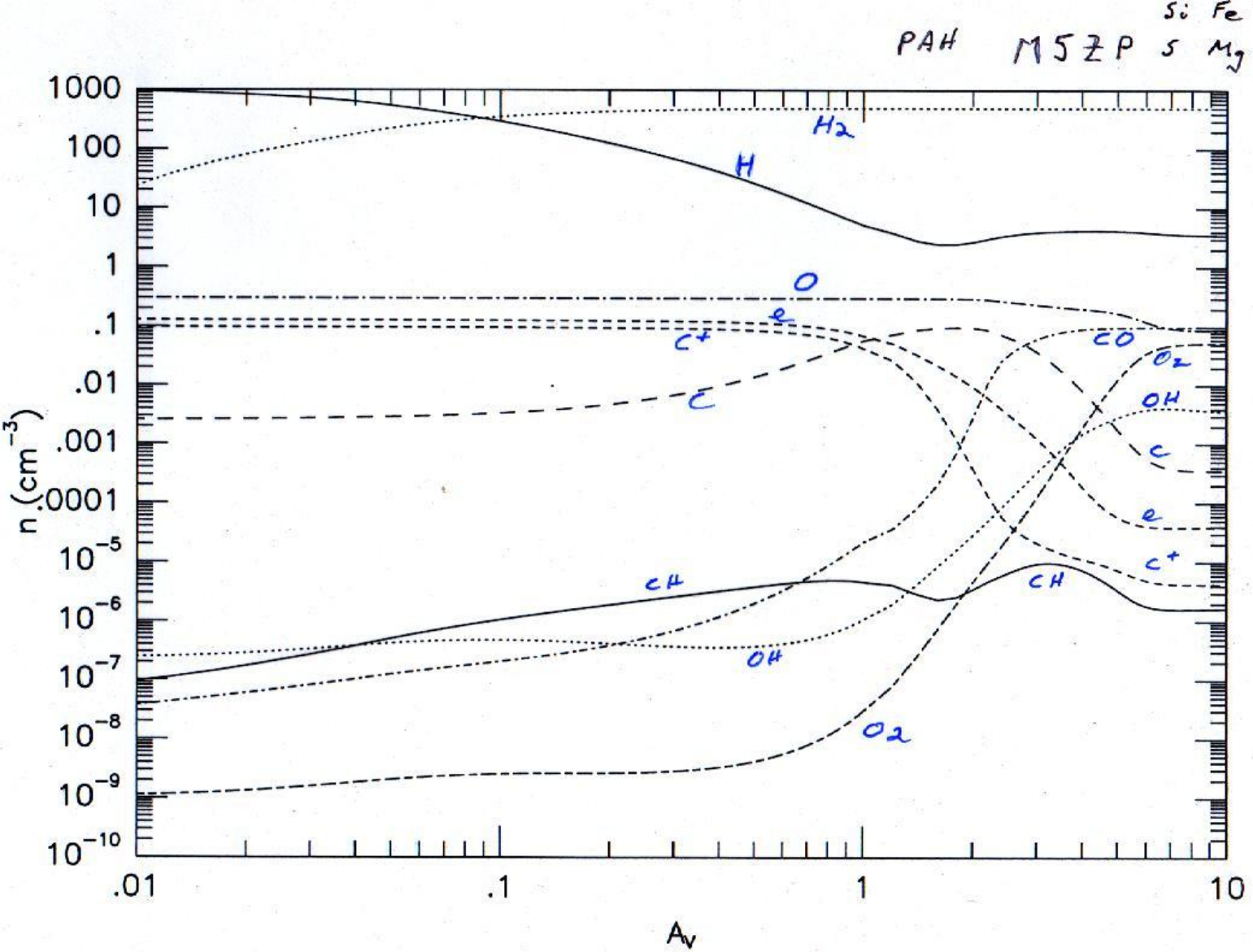

M5Z Si Fe S Mg
1000
100
10
1
.1
.01
.001
.0001
10^{-5}
10^{-6}
10^{-7}
10^{-8}
10^{-9}
10^{-10}
n (cm^{-3})
.01
.1
1
10
A_V
H_2
H
O
e
C^+
C
e
CO
C^+
C
CO
OH
CH
OH
O_2
CH
OH
O_2


Si Fe
PAH MSZP S Mg
1000
100
10
1
.1
.01
.001
.0001
10^{-5}
10^{-6}
10^{-7}
10^{-8}
10^{-9}
10^{-10}
n (cm^{-3})
.01
.1
1
10
A_V
H_2
H
O
e
C^+
C
CO
O_2
OH
C
e
C^+
CH
CH
OH
O_2

van Dishoeck + Black 1986

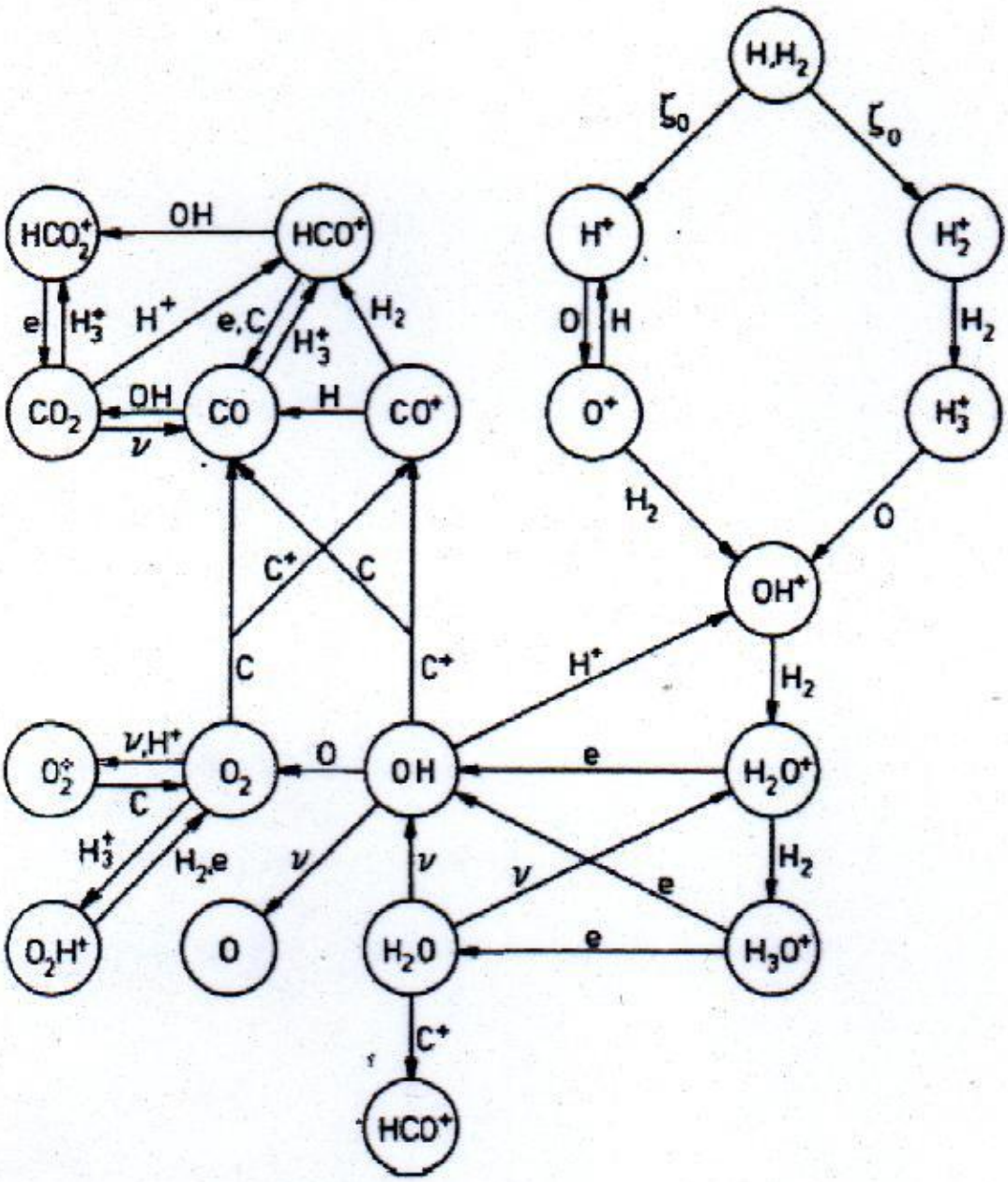


FIG. 4.—The most important reactions for the oxygen-bearing molecules included in the chemical network.

PAH Rates

Wolfire, McKee, Hollenbach, Tielens (2003)

Draine + Sutin (1987) for collisions
Bakes + Tielens (1994) for photo

disk, $N_C = 35$, $a = (N_C/1.222)^{0.5}$
3-15 Å $\Rightarrow$ $C/H \sim 22\times10^{-6}$, $n_{PAH}/n \sim 6\times10^{-7}$

$H^+ + PAH^- \rightarrow H + PAH^0$ $\quad 8.3\times10^{-7} T_2^{-0.5} \phi_{PAH}$

With $\phi_{PAH} \sim .5$ $\Rightarrow$ good fit to
$T, n, P_{eh}, [CII]/H$ in CNM

CI/CII $\quad C^+ + PAH^- \rightarrow C + PAH^0$

Additional Rates

$H^+ + PAH^0 \rightarrow PAH^+ + H$ $\quad 3.1\times10^{-8} \phi_{PAH}$

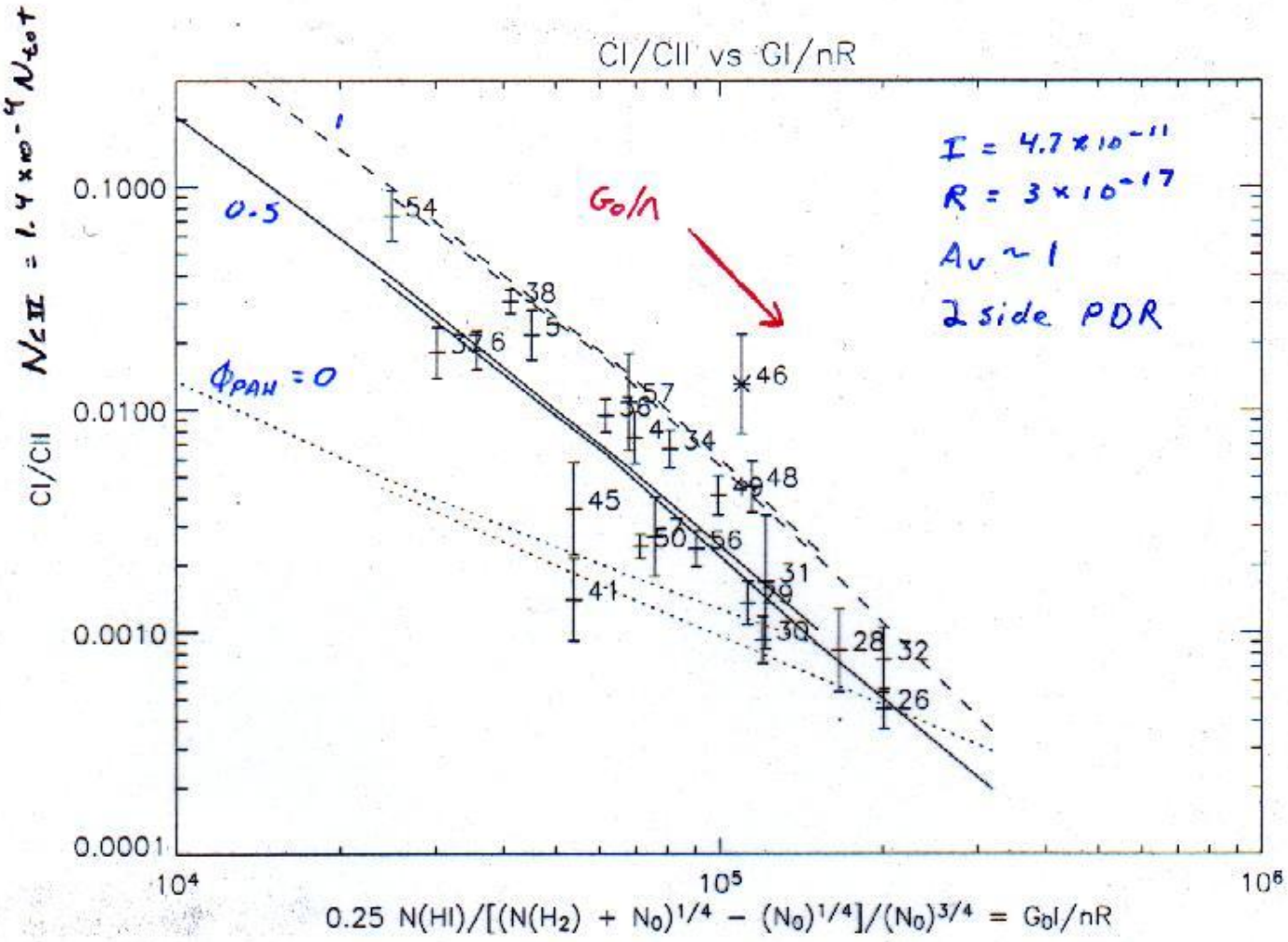
$e + PAH^+ \rightarrow PAH^0$ $\quad 3.5\times10^{-5} T_2^{-0.5} \phi_{PAH}$

$e + PAH^0 \rightarrow PAH^-$ $\quad 1.34\times10^{-6} \phi_{PAH}$

Collision rates of like ionization states scale as $1/\sqrt{m}$

$h\nu + PAH^0 \rightarrow PAH^+ + e$ $\quad 7.85\times10^{-9} G_0$ (Draine Field)

$h\nu + PAH^- \rightarrow PAH^0 + e^-$ $\quad 2.00\times10^{-8} G_0$



Wolfire, Kaufman, Tielens, + Hollenbach