

We are now in a position to evaluate K_1 as a function of T by using $m_{\text{HCl}}^{\text{(total)}}$ obtained from quench pH (table 2) and $m_{\text{HCl}}^{\text{(ex)}}$ obtained from the adjusted experimental curve of figure 8. These data are listed in table 3. $\log K_1$ is plotted as a function of temperature in figure 9 for both hydrogen buffers used. Errors indicated are based on maximum and minimum differences between the values of $\log m_{\text{HCl}}^{\text{(total)}}$ and the adjusted experimental values, $\log m_{\text{HCl}}^{\text{(ex)}}$ (see fig. 8). The error assigned to $\log m_{\text{HCl}}^{\text{(ex)}}$ is ± 0.04 .

Figure 9 shows that K_1 values obtained with the NB and MH buffers are consistent with each other even though the gas compositions imposed by these two buffers are very different. The solid line was obtained by a least-squares fit through the values of K_1 listed in table 3. Its analytical expression is

$$\log K_1 = \frac{9376}{T} - 14.24 \quad (15)$$

An independent set of values for K_1 , derived from conductivity measurements at P and T, has been reported by Franck (1956, 1961). His two values falling into our experimental range are also shown in figure 9. The agreement between the two sets of data is surprisingly good, considering the errors and assumptions involved in the two entirely independent techniques. This reinforces the interpretation of our experimental data (eq (11) to (14) and fig. 8) and provides an independent check on Franck's values for K_1 . Experiments at 1000 bars (see fig. 5) show a similar trend.

In figure 10 we have summarized the adjusted experimental data. Each set of data for a particular hydrogen buffer and pressure can be expressed as two straight lines in $m_{\text{HCl}}^{\text{(ex)}}$ versus $1/T$ space, with the

TABLE 3
Equilibrium constant K_1 for the reaction:
 $\text{HCl} \rightleftharpoons \text{H}^+ + \text{Cl}^-$ (eq 11)

Run no.	Temp °K	$\log m_{\text{HCl}}^{\text{(total)}}$	$\log m_{\text{HCl}}^{\text{(ex)}}$	$\log K_1$
NB, OH(AgAgClX, HOCl) at 2000 bars pressure				
100-F	817	-0.59	-0.60	-3.8436
100-E	811	-0.58	-0.615	-2.7614
100-U	767	-0.58	-0.70	-1.514
100-V	762	-0.63	-0.71	-2.130
100-X	718	-0.58	-0.85	-0.9772
100-W	712	-0.59	-0.87	-0.9572
101-I	697	-0.59	-0.93	-0.780
101-H	694	-0.53	-0.94	-0.5494
100-Y	675	-0.55	-1.03	-0.4170
100-Z	673	-0.54	-1.05	-0.3522
MH, OH(AgAgClX, HOCl) at 2000 bars pressure				
100-A	767	-1.423	-1.62	-2.1182
100-B	762	-1.438	-1.63	-2.1354
101-G	721	-1.328	-1.75	-1.319
101-F	707	-1.323	-1.81	-1.180

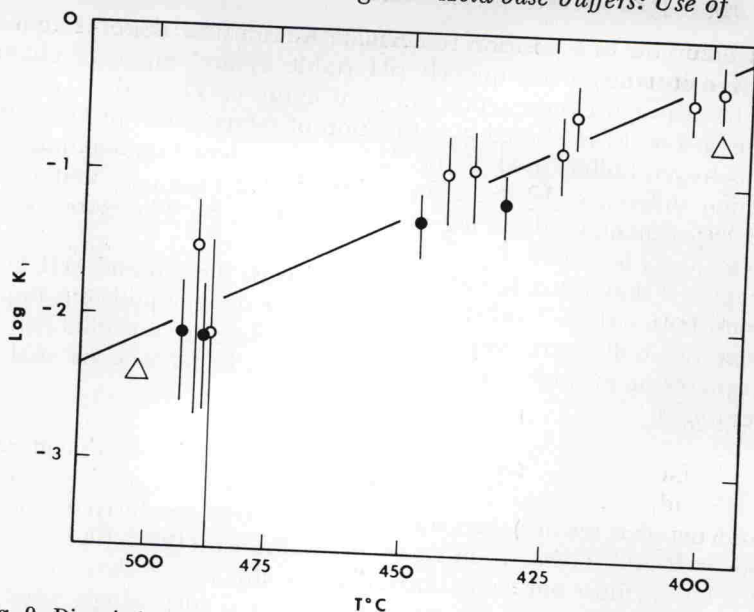


Fig. 9. Dissociation constant of HCl , K_1 , at 2000 bars pressure. Plotted are the values of table 3, with open circles representing $\text{Ni} + \text{NiO}$ and closed circles, $\text{Fe}_2\text{O}_3 + \text{Fe}_3\text{O}_4$. The length of each bar represents the maximum possible error for an individual data point. The solid line is the least squares fit through these points (see eq 15). The two triangles are values for K_1 derived by Franck (1956, 1961).

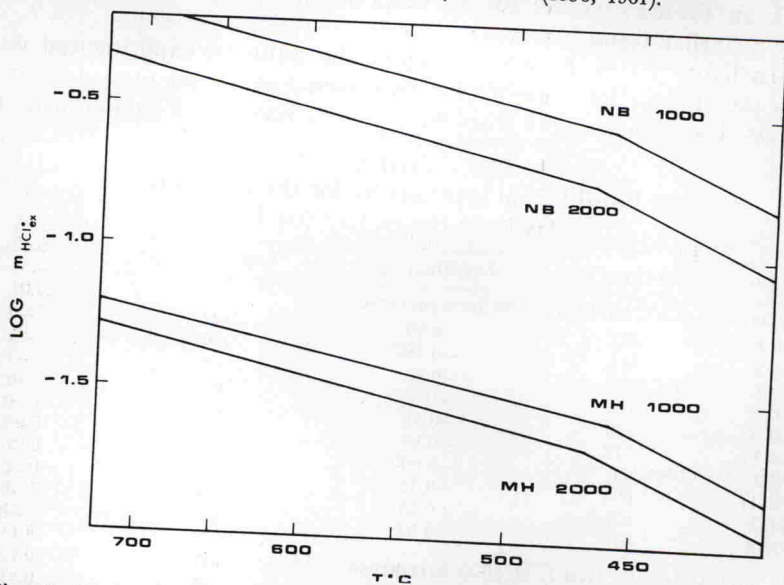


Fig. 10. Summary of adjusted experimental data. The data of figures 4, 5, 6, and 7 have been adjusted by the procedure illustrated in figure 8. The breaks in slope are the observed melting points of AgCl at 1000 and 2000 bars pressure. Buffer notation as in figure 1.