C.G. Ramsay,
EDTA Titration of Cadmium and Mercury
JCE,**54**-11(1977)714-717

$$M + L \rightleftharpoons ML$$

is defined by the law of mass action as

$$K = \frac{[ML]}{[M][L]}$$

However, the equilibria in real aqueous systems are never

$$K' = \frac{[ML']}{[M'][L']}$$

where [M′] represents the total concentration of all speci

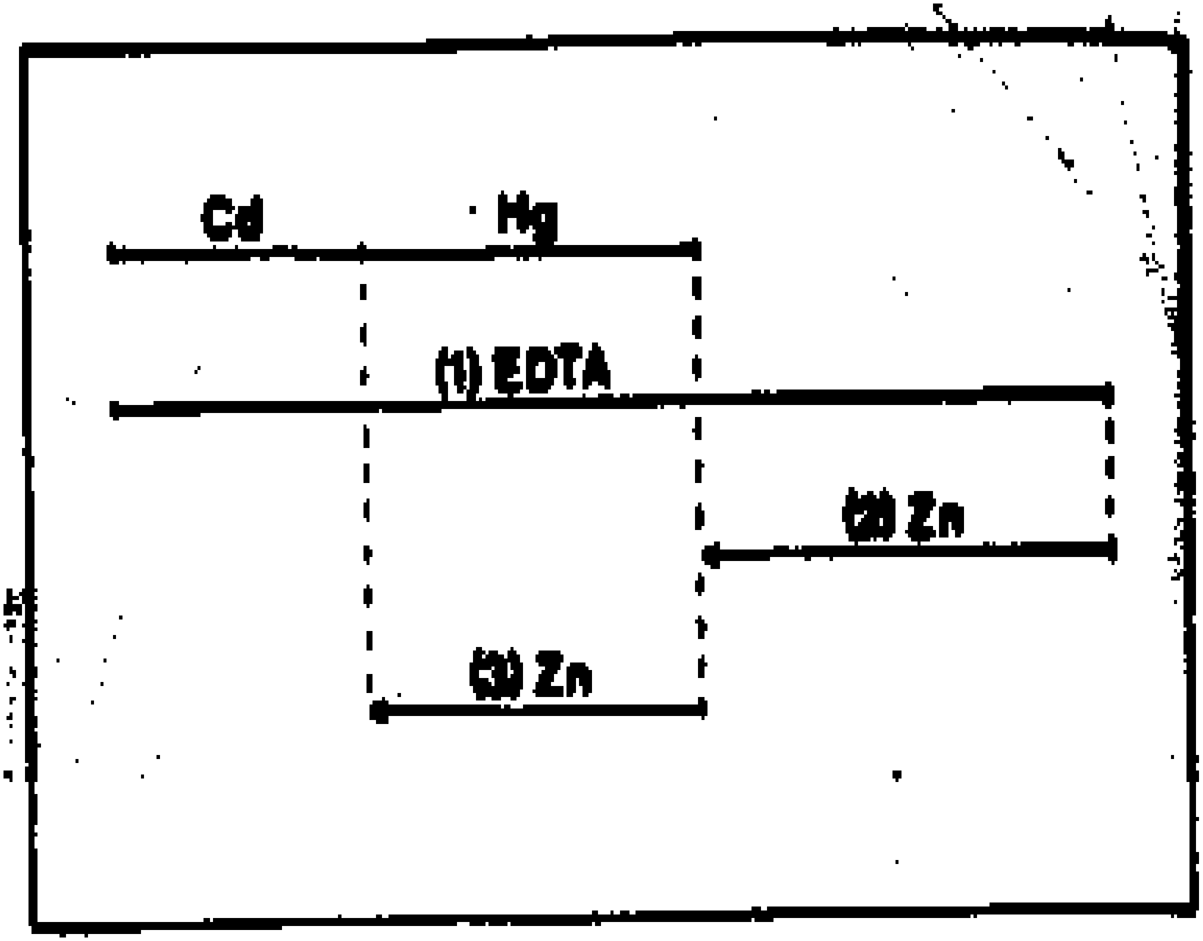


Figure 1. Stick-diagram representing the cadmium(II) and mercury(II) titration. (1) Addition of excess of EDTA, (2) back-titration with zinc(II), (3) second back-titration after masking mercury(II) to release EDTA from HgEDTA complex. Cd = (1)-(2)-(3); Hg = (3).

$$[M'] = [M] + [MA] + \ldots + [MA_i]$$

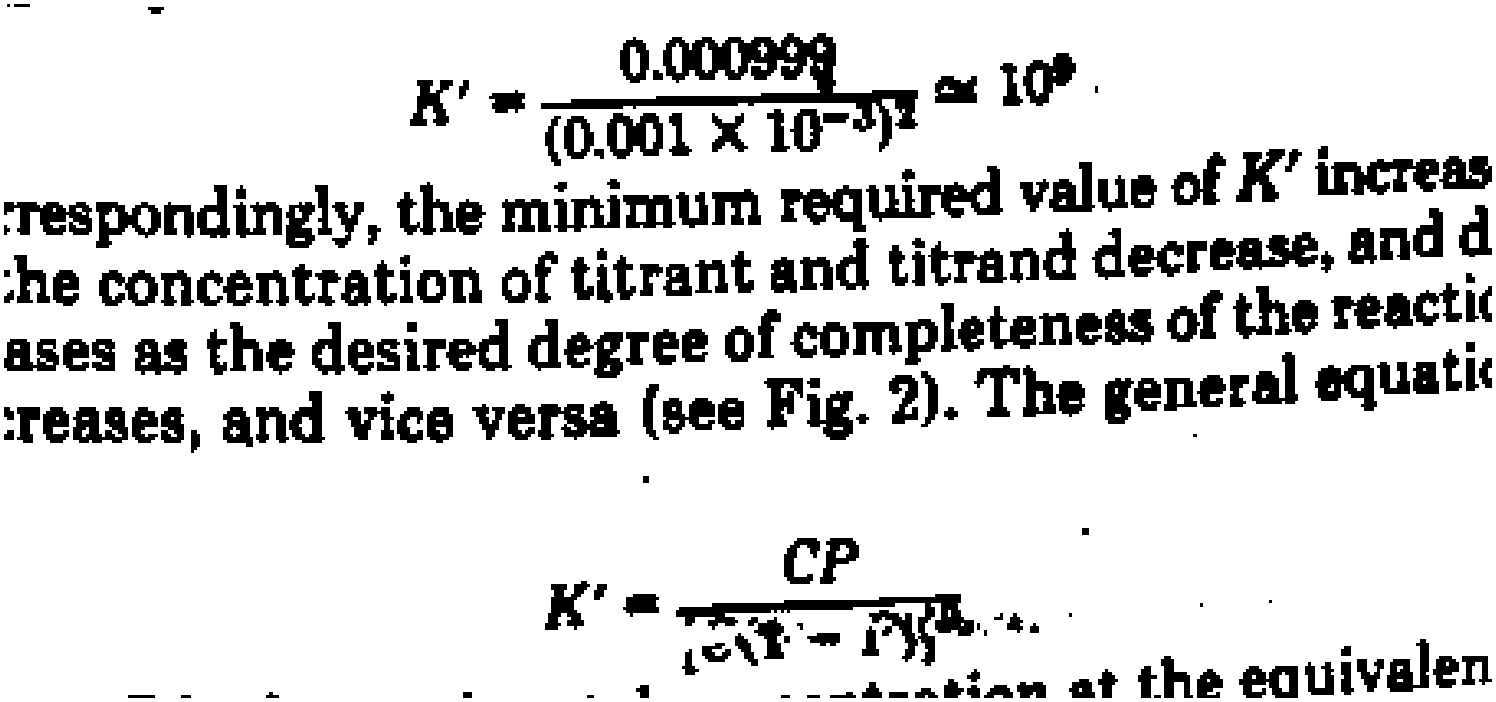
$$= [M]\left(1 + \sum_{i=1}^{i} [A]^i \beta_i\right)$$

$$= [M]\,\alpha_{M(A)}$$

$$\beta_i = \frac{[MA_i]}{[M][A]^i}$$

[illegible] formation constants and the concentration of A an

$$K' = \frac{[ML]\alpha_{ML(T)}}{[M][L]\alpha_{M(T)}\alpha_{L(T)}} = \frac{K\alpha_{ML(T)}}{\alpha_{M(T)}\alpha_{L(T)}}$$



$$K' = \frac{0.000999}{(0.001 \times 10^{-3})^2} \simeq 10^9$$

respondingly, the minimum required value of K' increas
he concentration of titrant and titrand decrease, and d
ases as the desired degree of completeness of the reacti
reases, and vice versa (see Fig. 2). The general equati

$$K' = \frac{CP}{[C(1 - P)]^2}$$

ntration at the equivalen

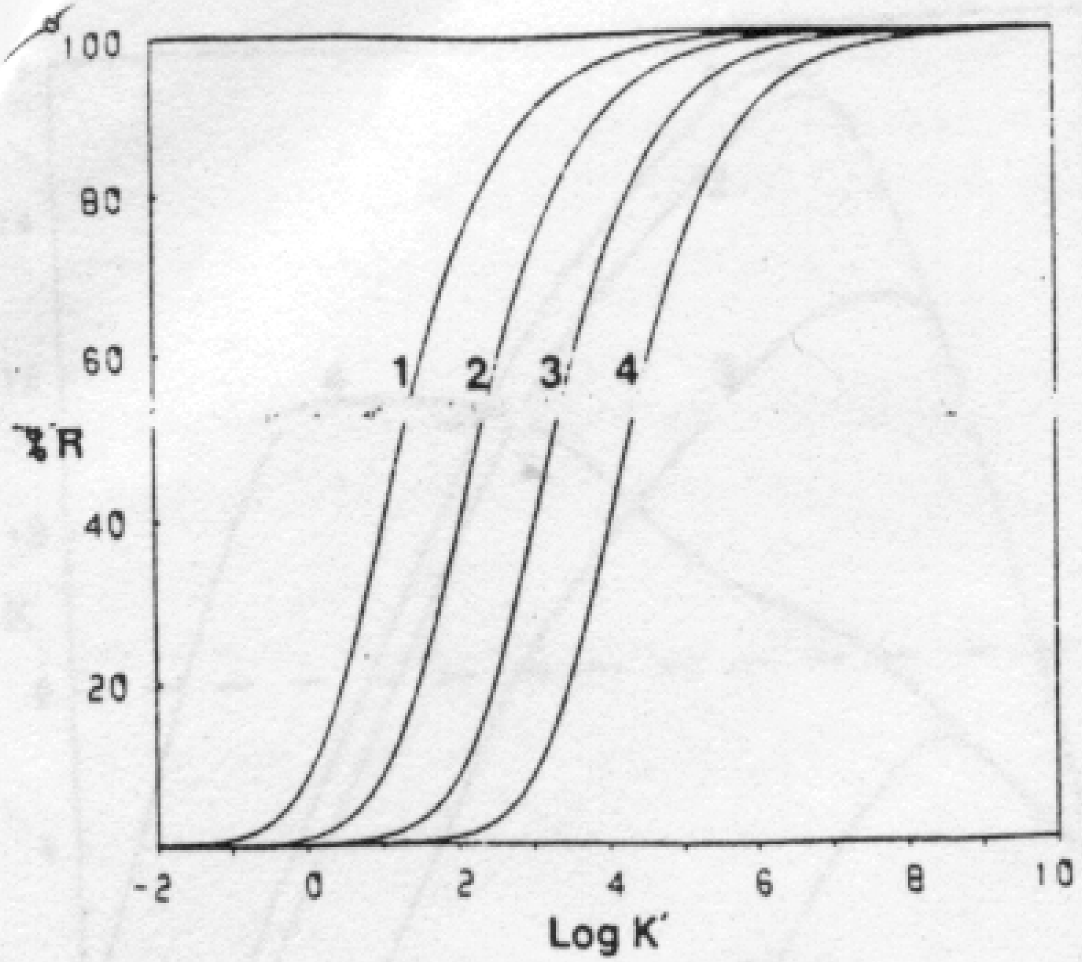


Figure 2. Dependence of the degree of completeness of the reaction (%R) on log *K*' for solutions of fixed total metal concentration (*C*) at the equivalence point. *C* = 0.1 *M* (1); 0.01 *M* (2); 0.001 *M* (3); 0.0001 *M* (4).

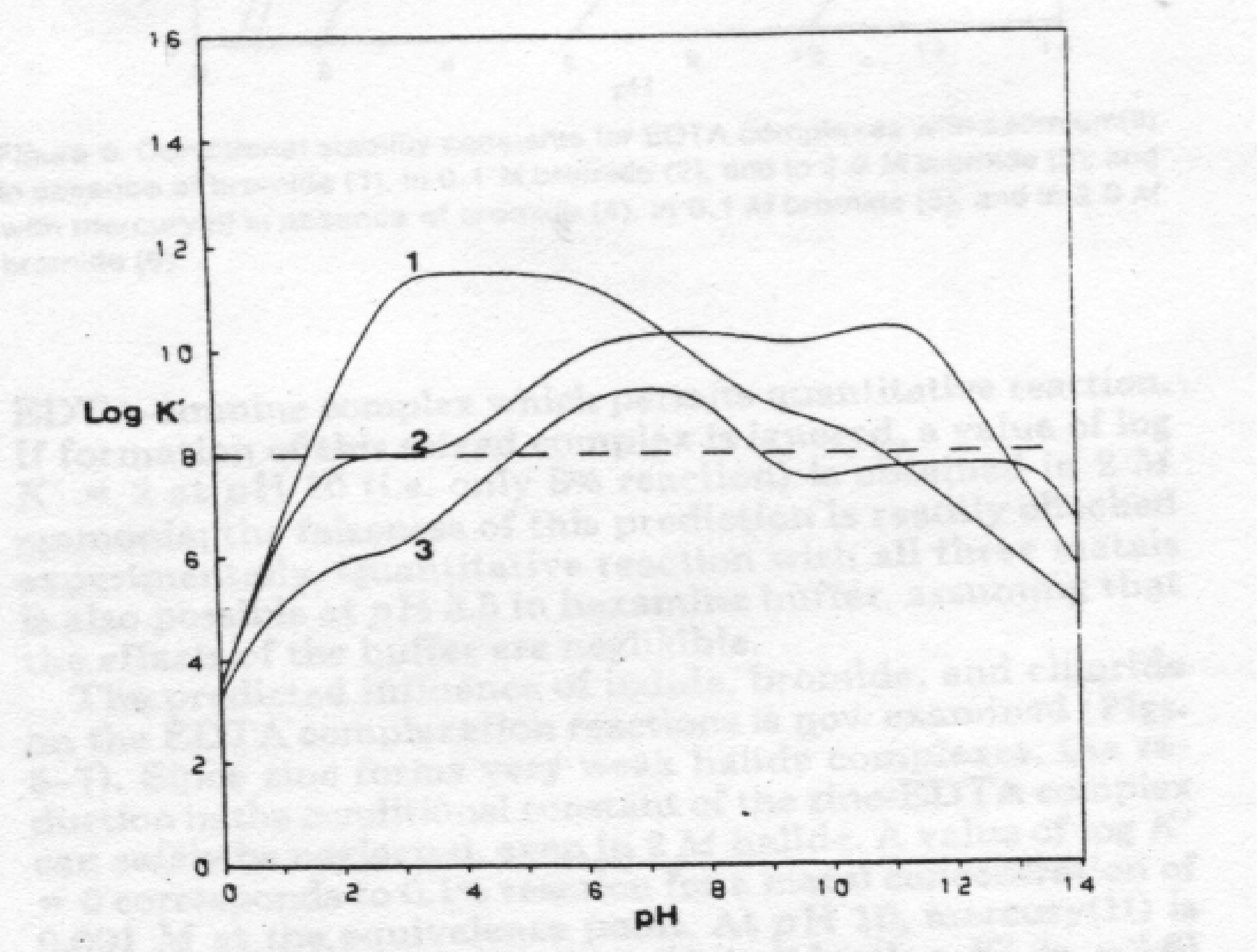


Figure 3. Conditional stability constants for EDTA complexes with mercury(II) in absence of NH_3 (1), in 0.2 *M* total NH_3 (2), and in 2.0 *M* NH_3 (3).

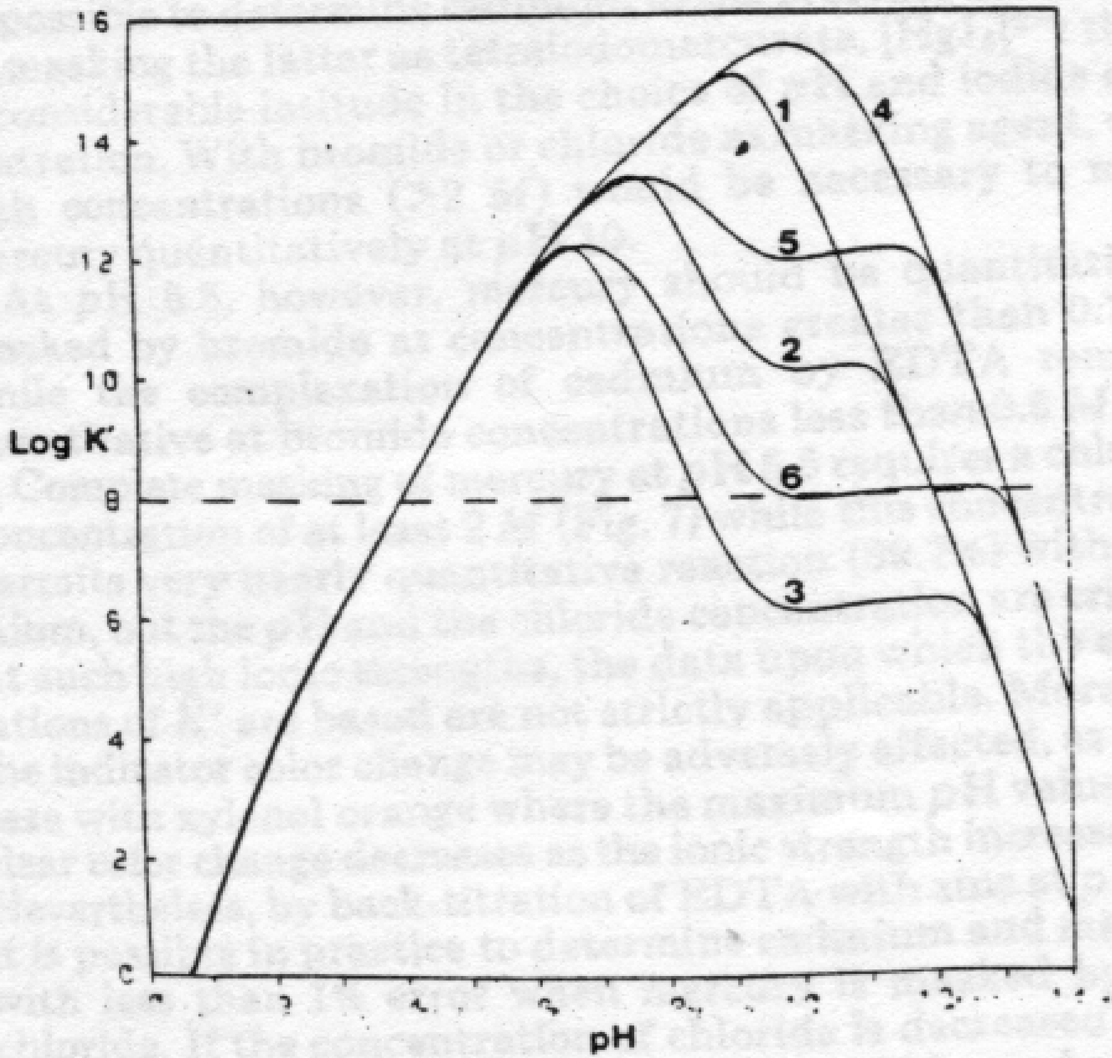


Figure 4. Conditional stability constants for EDTA complexes with zinc(II) in absence of NH_3 (1), in 0.2 *M* total NH_3 (2), and in 2.0 *M* NH_3 (3); and with cadmium(II) in absence of NH_3 (4), in 0.2 *M* NH_3 (5), and in 2.0 *M* NH_3 (6).

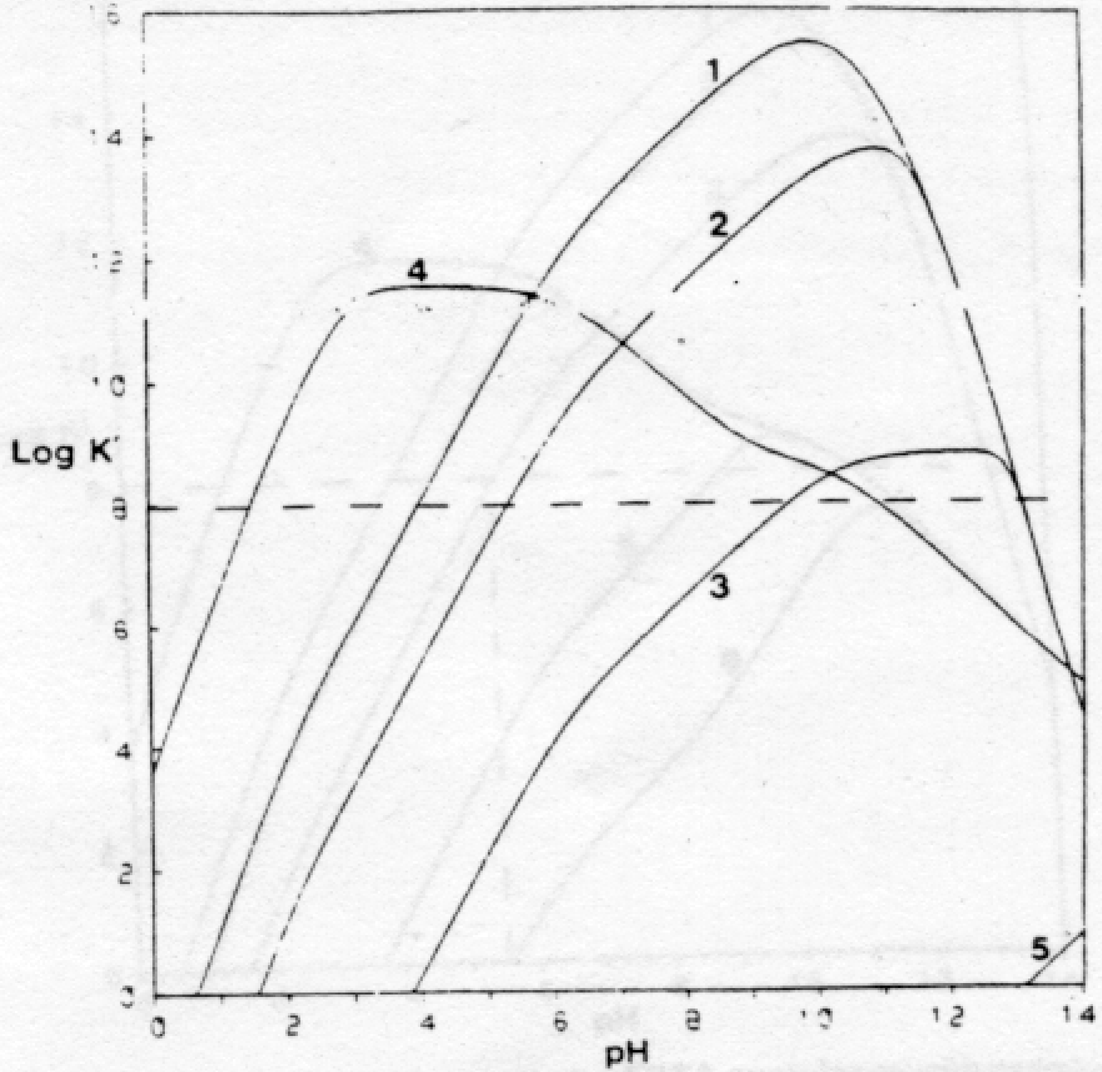


Figure 5. Conditional stability constants for EDTA complexes with cadmium(II) in absence of iodide (1), in 0.1 *M* iodide (2), and in 2.0 *M* iodide (3); and with mercury(II) in absence of iodide (4), and in 0.1 *M* iodide (5) (log *K'* in 2.0 *M* iodide is always less than zero)

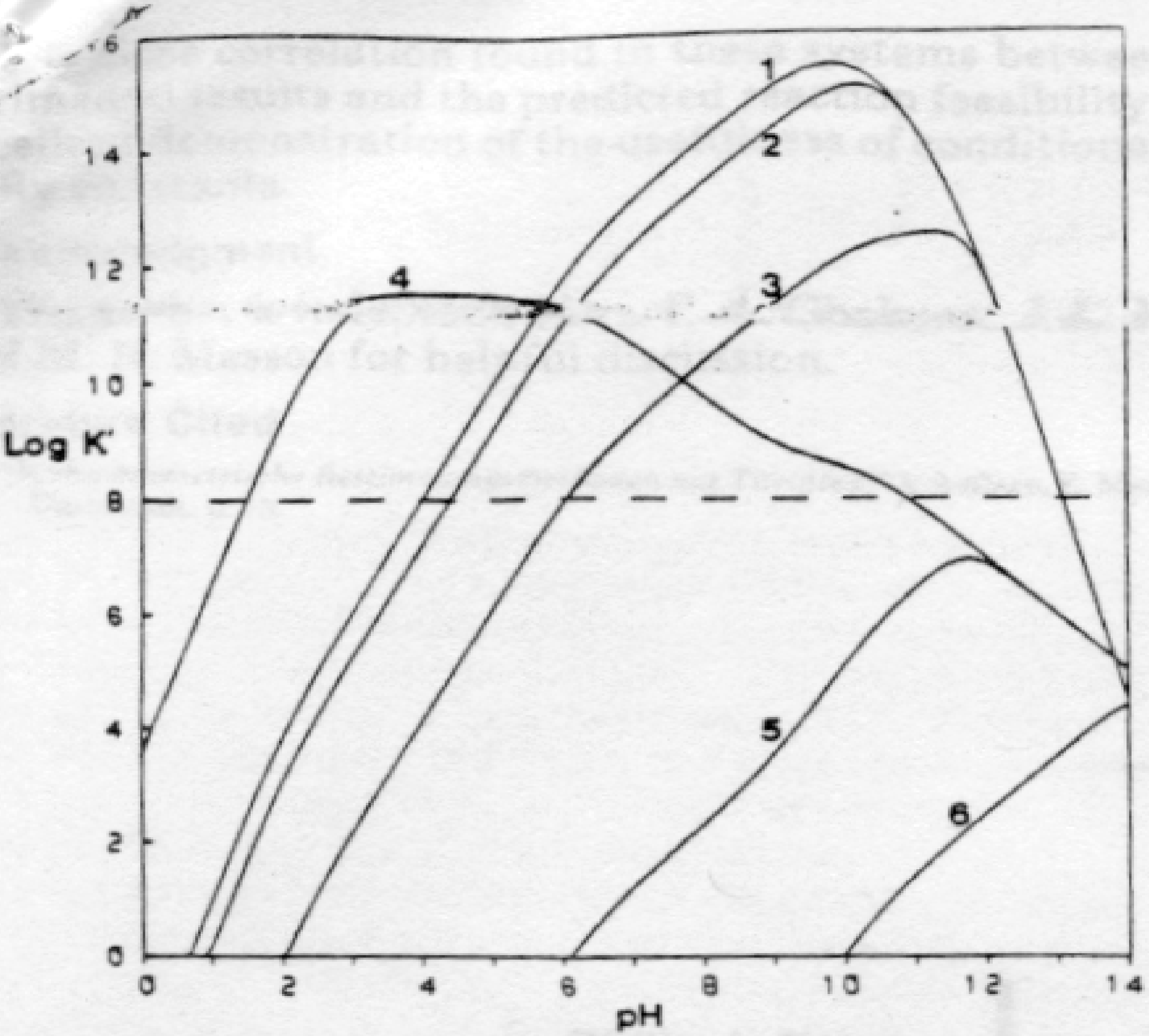


Figure 6. Conditional stability constants for EDTA complexes with cadmium(II) in absence of bromide (1), in 0.1 *M* bromide (2), and in 2.0 *M* bromide (3); and with mercury(II) in absence of bromide (4), in 0.1 *M* bromide (5), and in 2.0 *M* bromide (6).

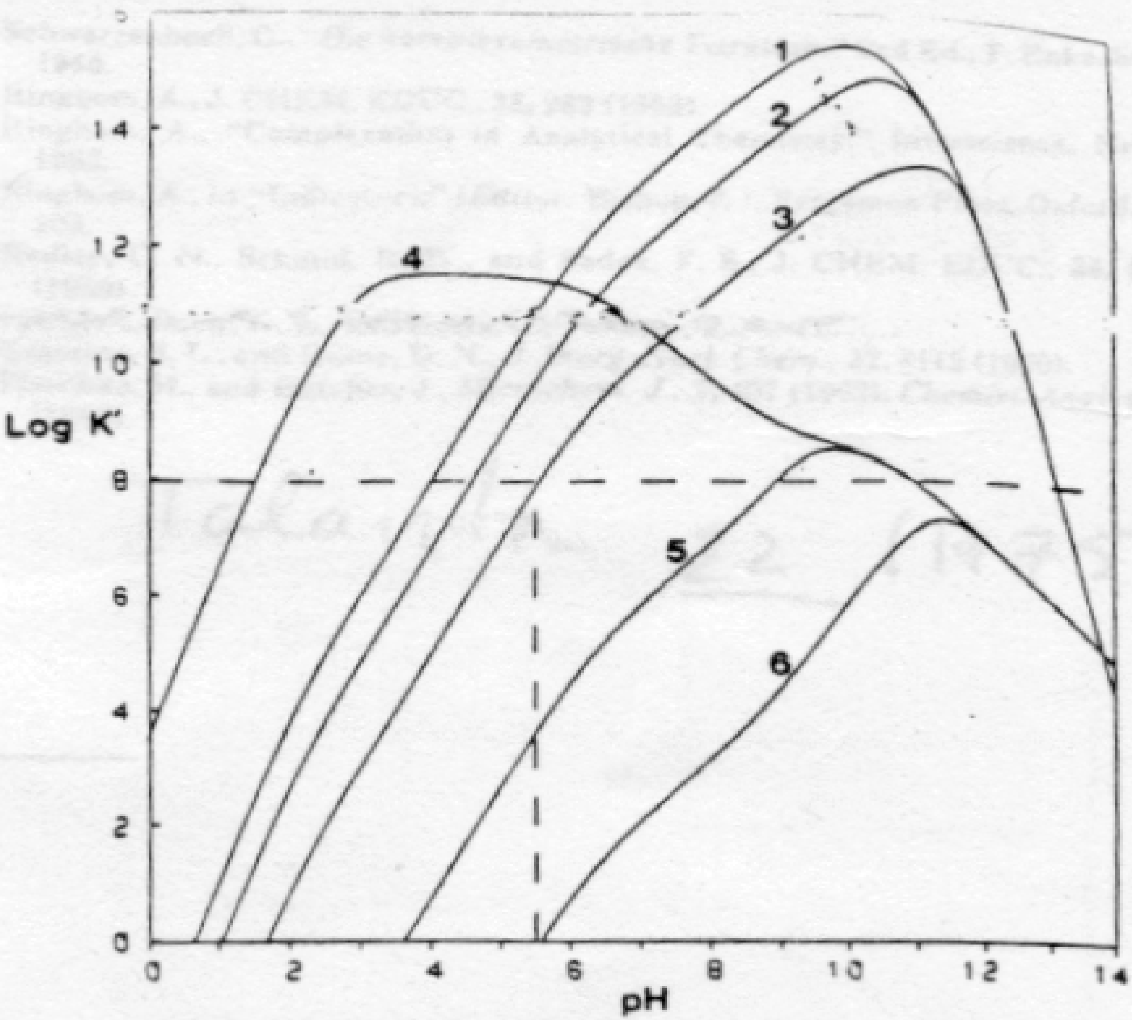
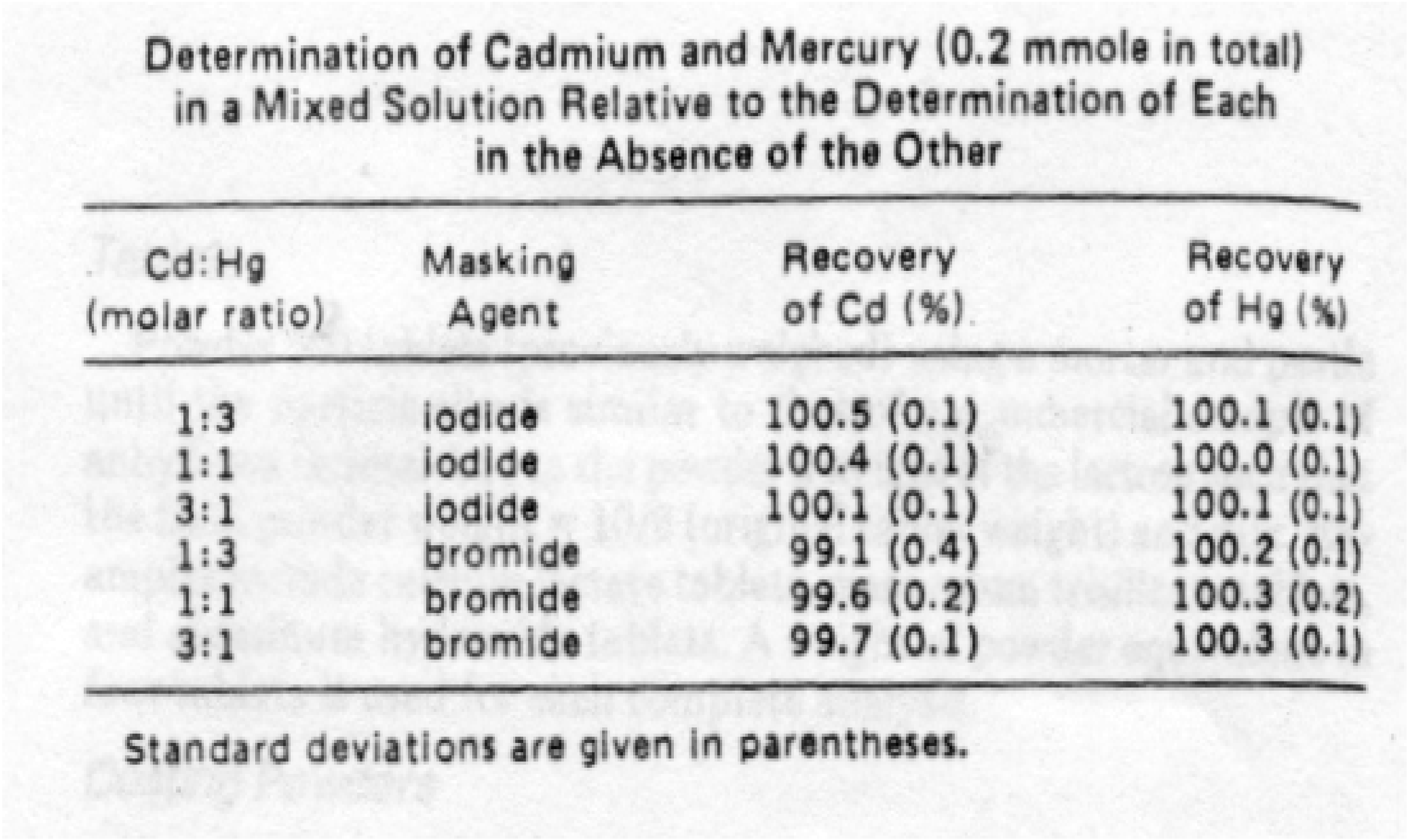


Figure 7. Conditional stability constants for EDTA complexes with cadmium(II) in absence of chloride (1), in 0.2 *M* chloride (2), and in 2.0 *M* chloride (3); and with mercury(II) in absence of chloride (4), in 0.2 *M* chloride (5), and in 2.0 *M* chloride (6).

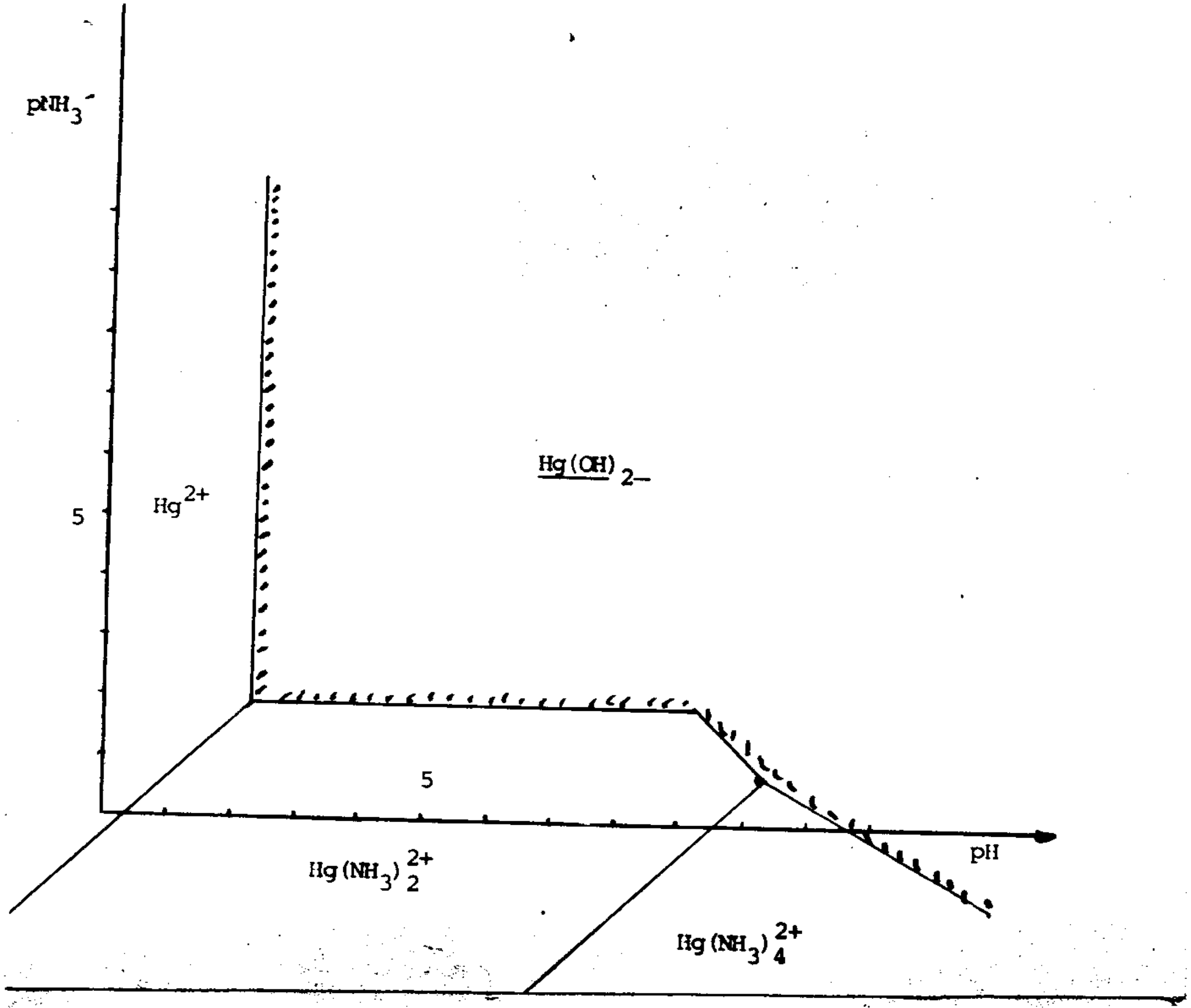


Determination of Cadmium and Mercury (0.2 mmole in total) in a Mixed Solution Relative to the Determination of Each in the Absence of the Other

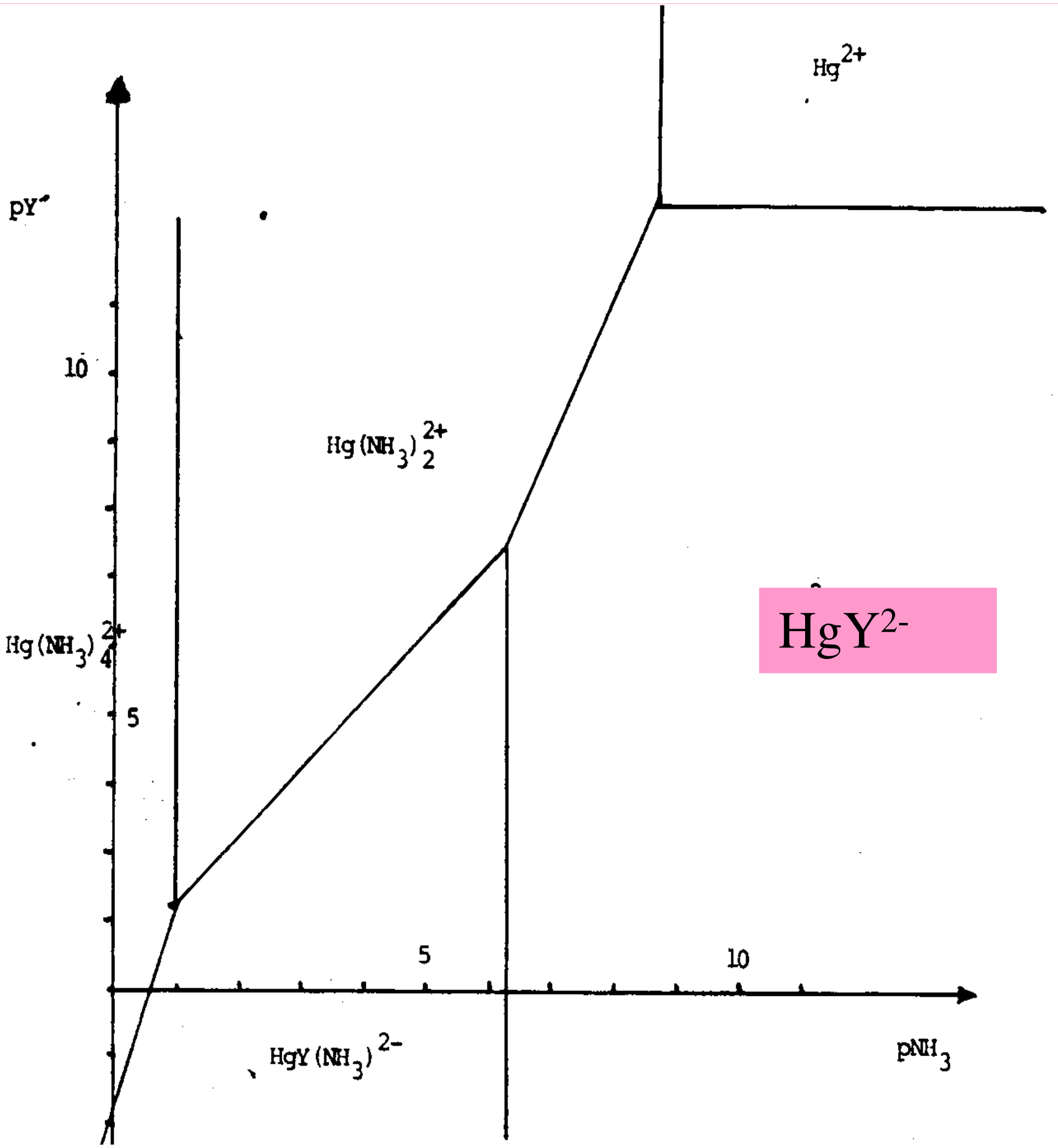
Cd:Hg (molar ratio)	Masking Agent	Recovery of Cd (%)	Recovery of Hg (%)
1:3	iodide	100.5 (0.1)	100.1 (0.1)
1:1	iodide	100.4 (0.1)	100.0 (0.1)
3:1	iodide	100.1 (0.1)	100.1 (0.1)
1:3	bromide	99.1 (0.4)	100.2 (0.1)
1:1	bromide	99.6 (0.2)	100.3 (0.2)
3:1	bromide	99.7 (0.1)	100.3 (0.1)

Standard deviations are given in parentheses.

DIAGRAMAS DZP Y DPE Para la valoración por retroceso de Hg(II)+Hg(II) por Y(-IV) EN MEDIO COMPLEJANTE (pH, pI, pNH_3) IMPUESTO.

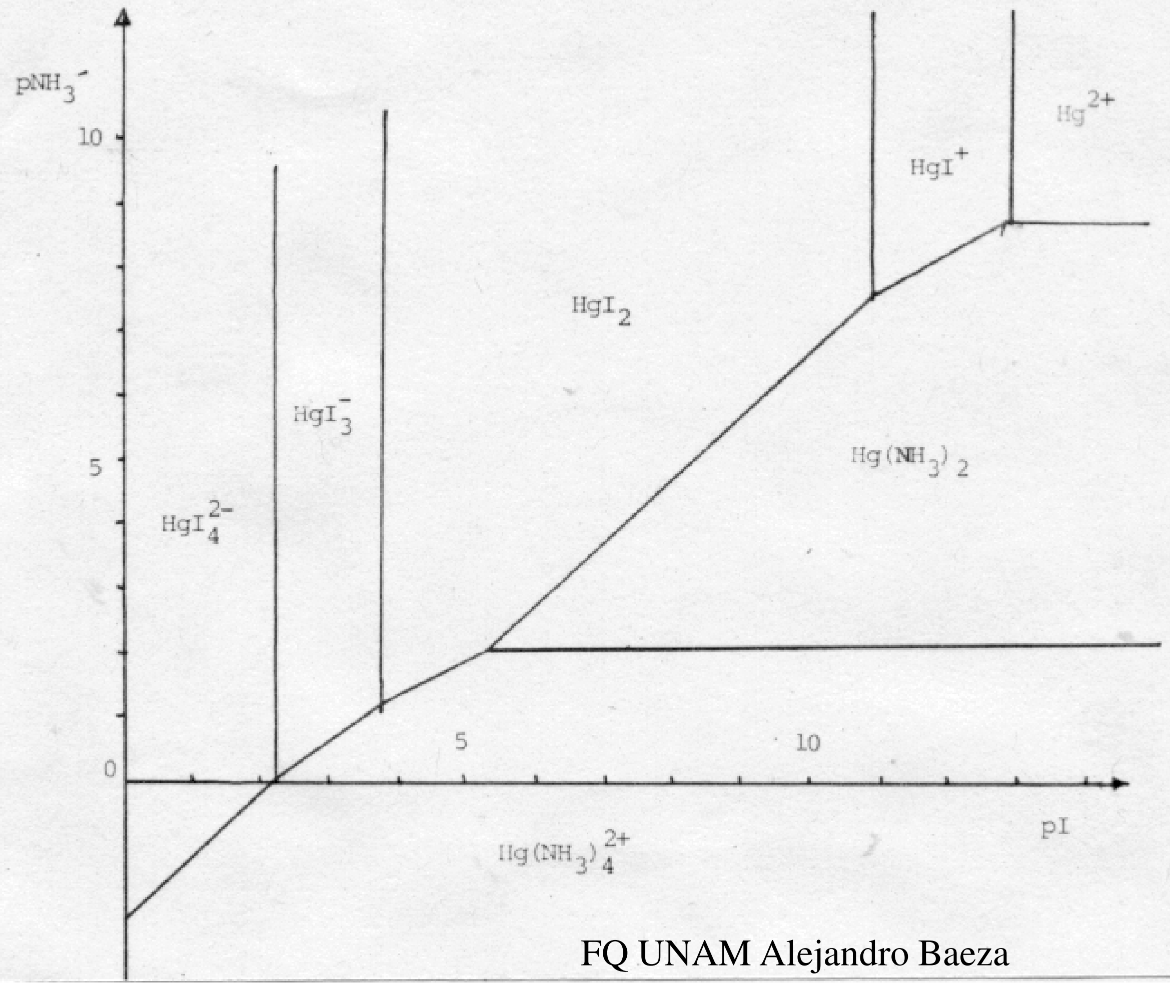


I

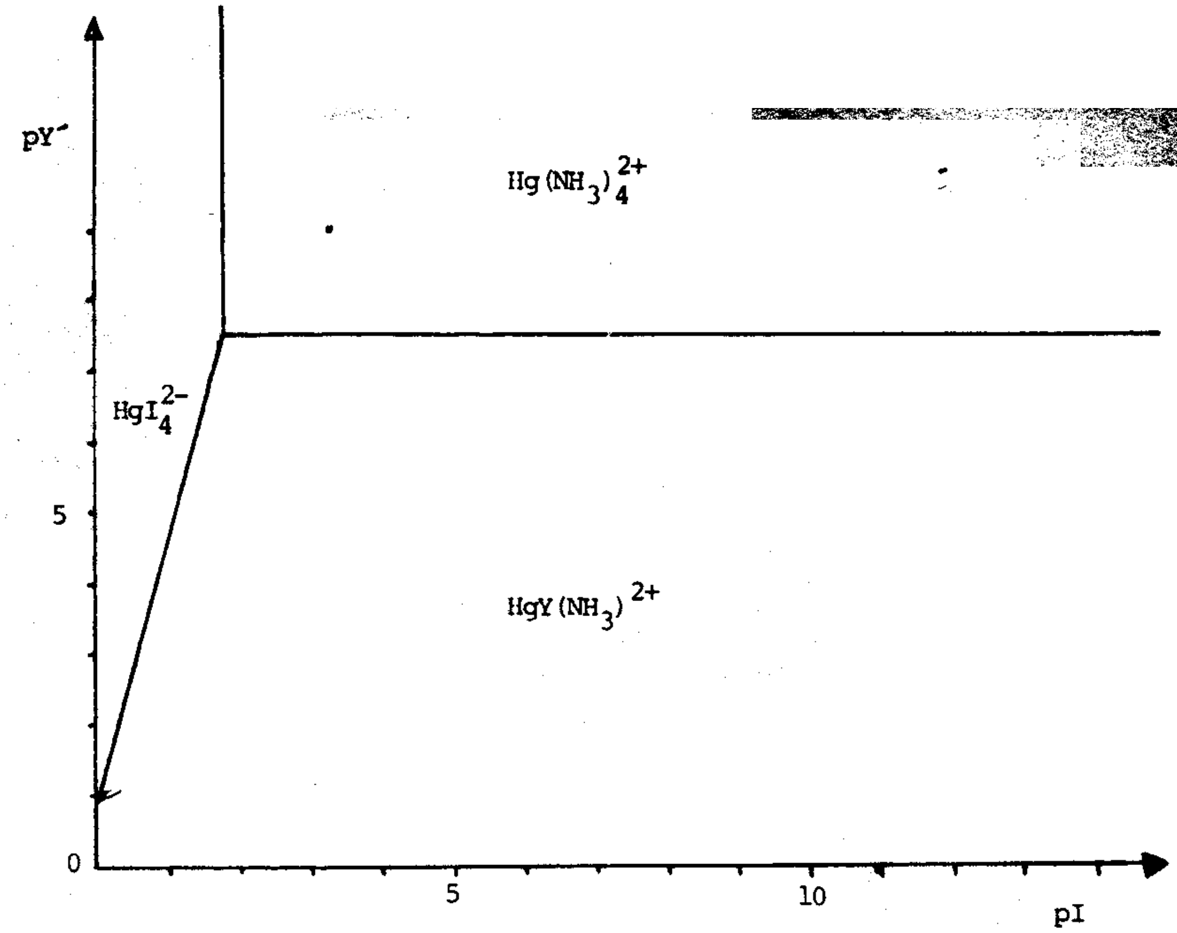


HgY^{2-}

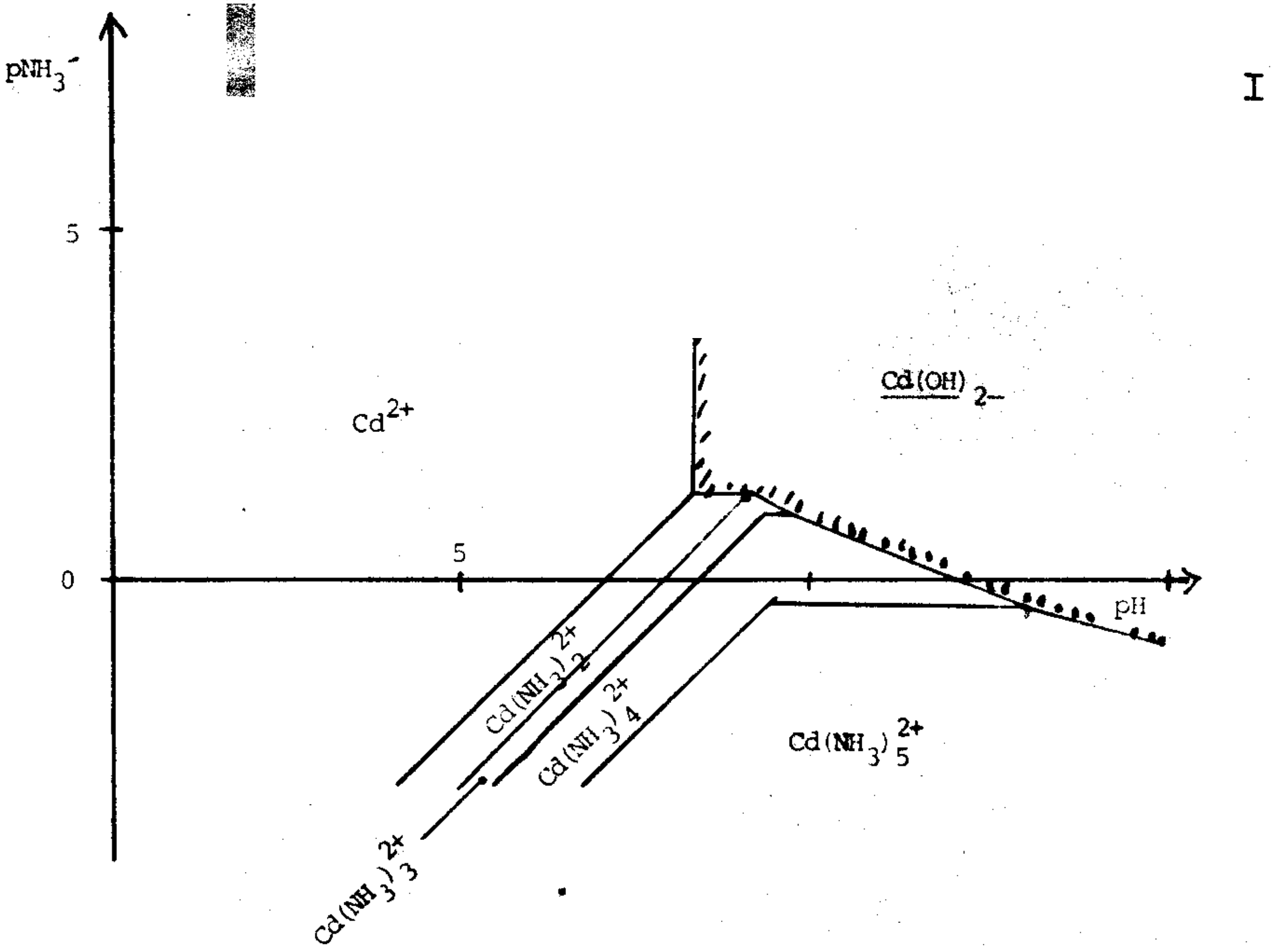
II

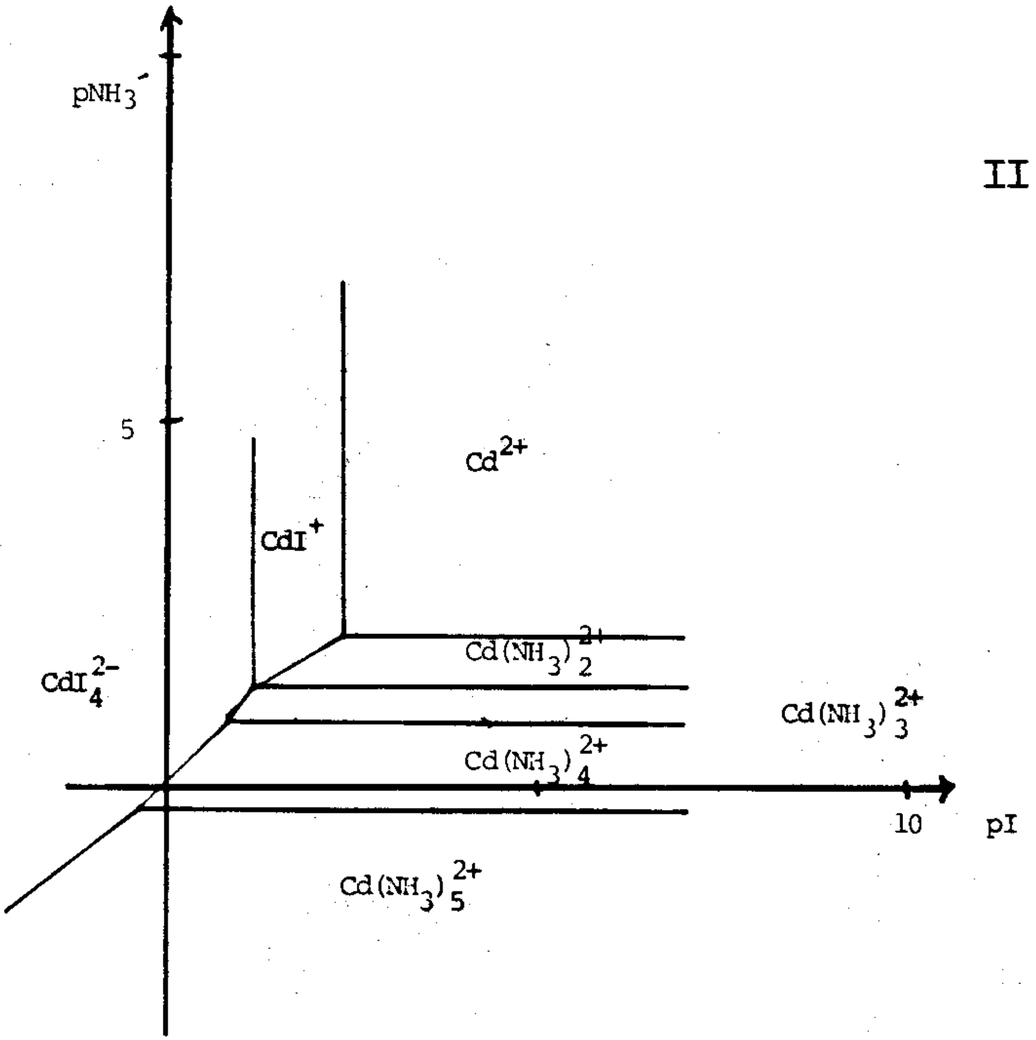


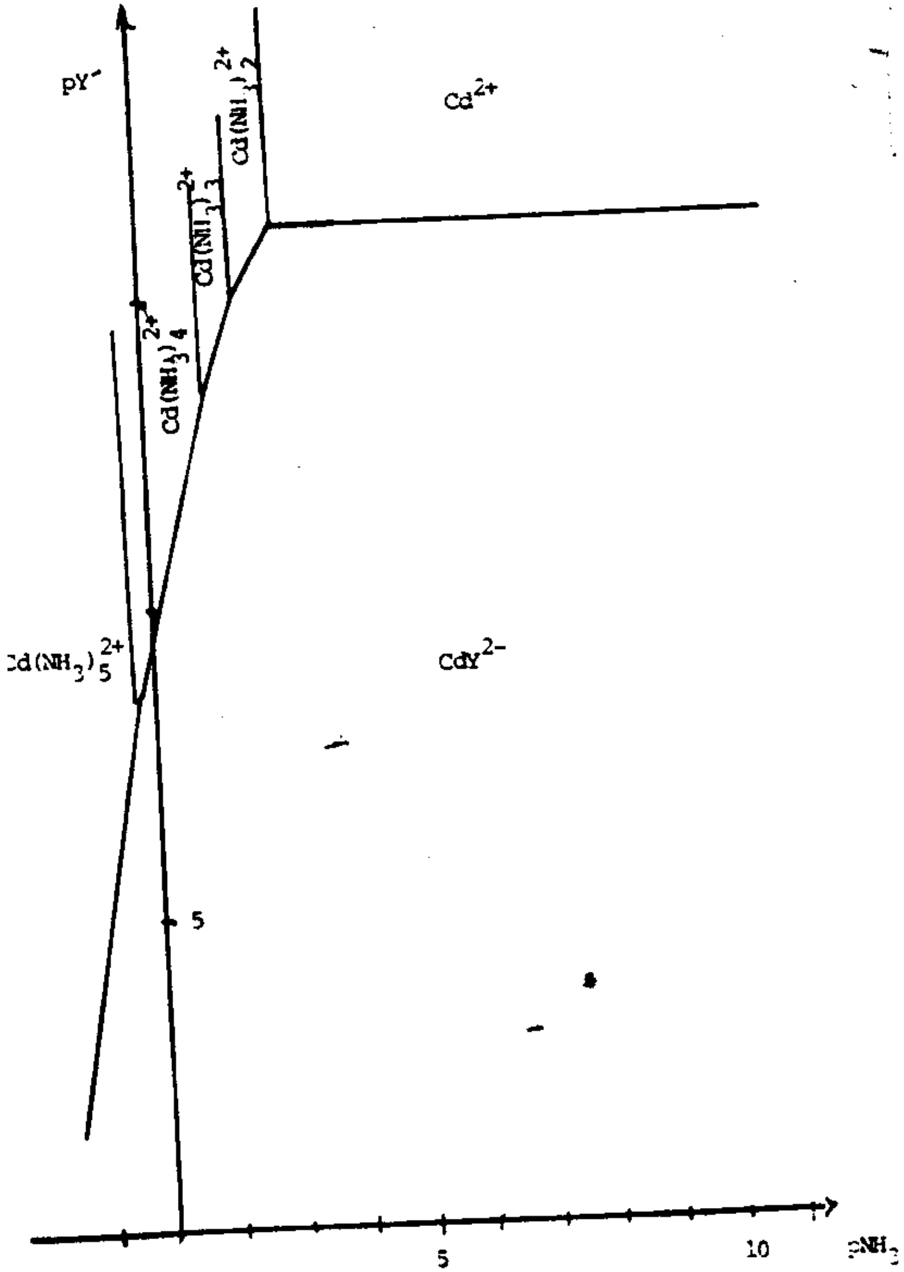
III

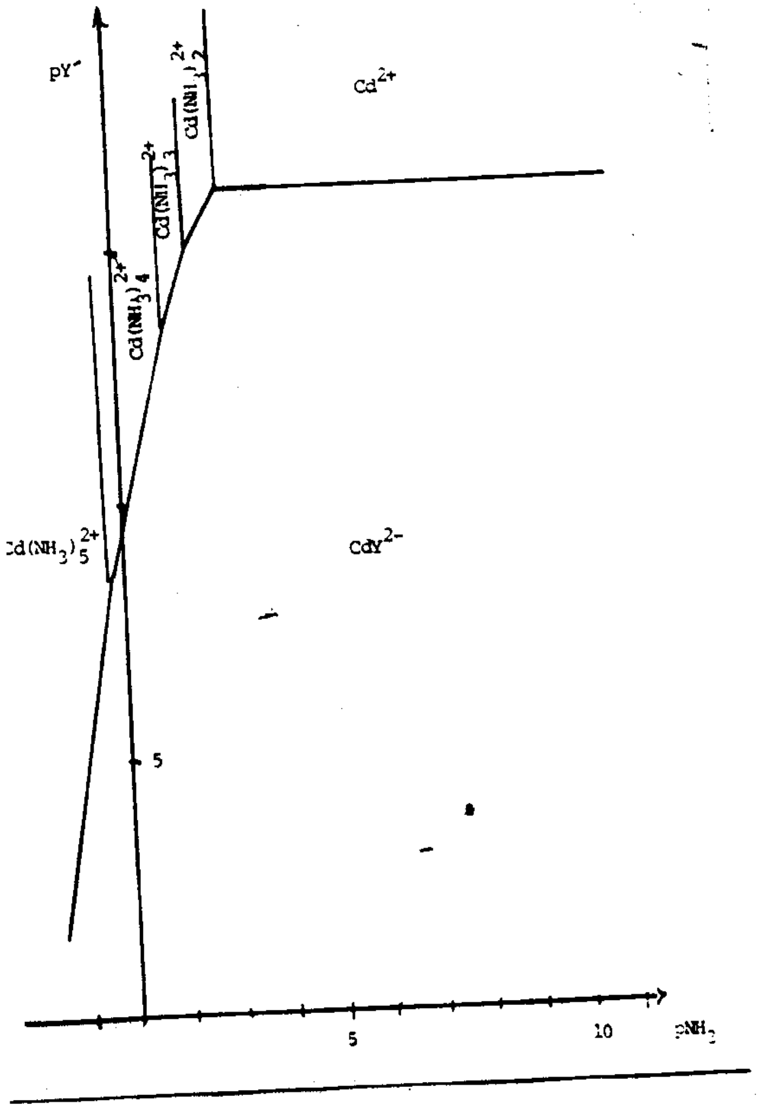


IV

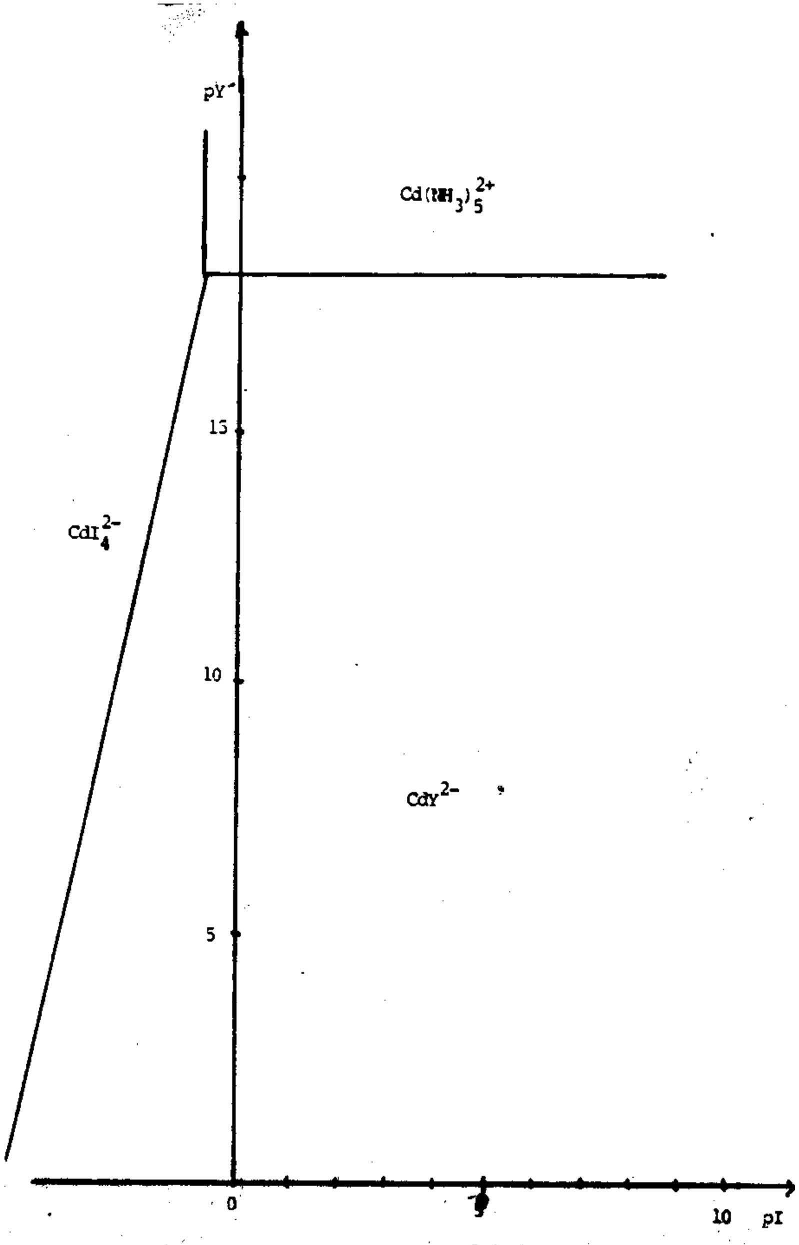

I
pNH3
5
0
5
pH
Cd2+
Cd(OH)2
Cd(NH3)2 2+
Cd(NH3)3 2+
Cd(NH3)4 2+
Cd(NH3)5 2+


II
pNH_3
5
Cd^{2+}
CdI^{+}
CdI_4^{2-}
$Cd(NH_3)_2^{2+}$
$Cd(NH_3)_3^{2+}$
$Cd(NH_3)_4^{2+}$
10
pI
$Cd(NH_3)_5^{2+}$


pY'
$Cd(NH_3)_2^{2+}$
Cd^{2+}
$Cd(NH_3)_3^{2+}$
$Cd(NH_3)_4^{2+}$
$Cd(NH_3)_5^{2+}$
CdY^{2-}
5
5
10
pNH_3


pY'
Cd^{2+}
$Cd(NH_3)_2^{2+}$
$Cd(NH_3)_3^{2+}$
$Cd(NH_3)_4^{2+}$
$Cd(NH_3)_5^{2+}$
CdY^{2-}
5
5
10
pNH_3

III


pY'
$Cd(NH_3)_5^{2+}$
CdI_4^{2-}
15
10
5
CdY^{2-}
0
5
10
pI

IV