

M.Hilmi EREN
04 - 98 - 3636

Anorganik Kimya II Lab.
2.Deney Grubu

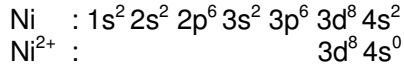
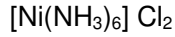
DENEY RAPORU

DENEY ADI UV Spektroskopisi ve Anorganik Bileşiklere Uygulanması (7 No'lu deney)

DENEY TARİHİ 24 Nisan 2003 Perşembe

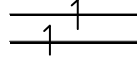
AMAÇ $[\text{Ni}(\text{NH}_3)_6] \text{Cl}_2$ kompleksinde Nikelin d orbitalindeki elektron geçişlerinin Spektrometre ile incelenmesi ve CFSE Kristal Alan Yarıлма Enerjisinin Hesaplanması

TEORİK BİLGİ

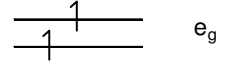


Zayıf Alanda;

$$\begin{aligned} \text{CFSE} &= 6(-4Dq) + 2(+6Dq) \\ &= -24 Dq + 12 Dq \\ &= -12Dq \end{aligned}$$



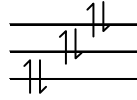
e_g



e_g

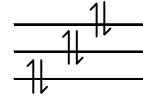
Kuvvetli Alanda;

$$\begin{aligned} \text{CFSE} &= 6(-4Dq) + 2(+6Dq) \\ &= -12 Dq \end{aligned}$$



t_{2g}

Zayıf Alan



t_{2g}

Kuvvetli Alan

$[\text{Ni}(\text{NH}_3)_6] \text{Cl}_2$ kompleksinin koordinasyon sayısı 6 dır. Oktahedral yapıdadır. Paramanyetik ve dış orbital kompleksidir.

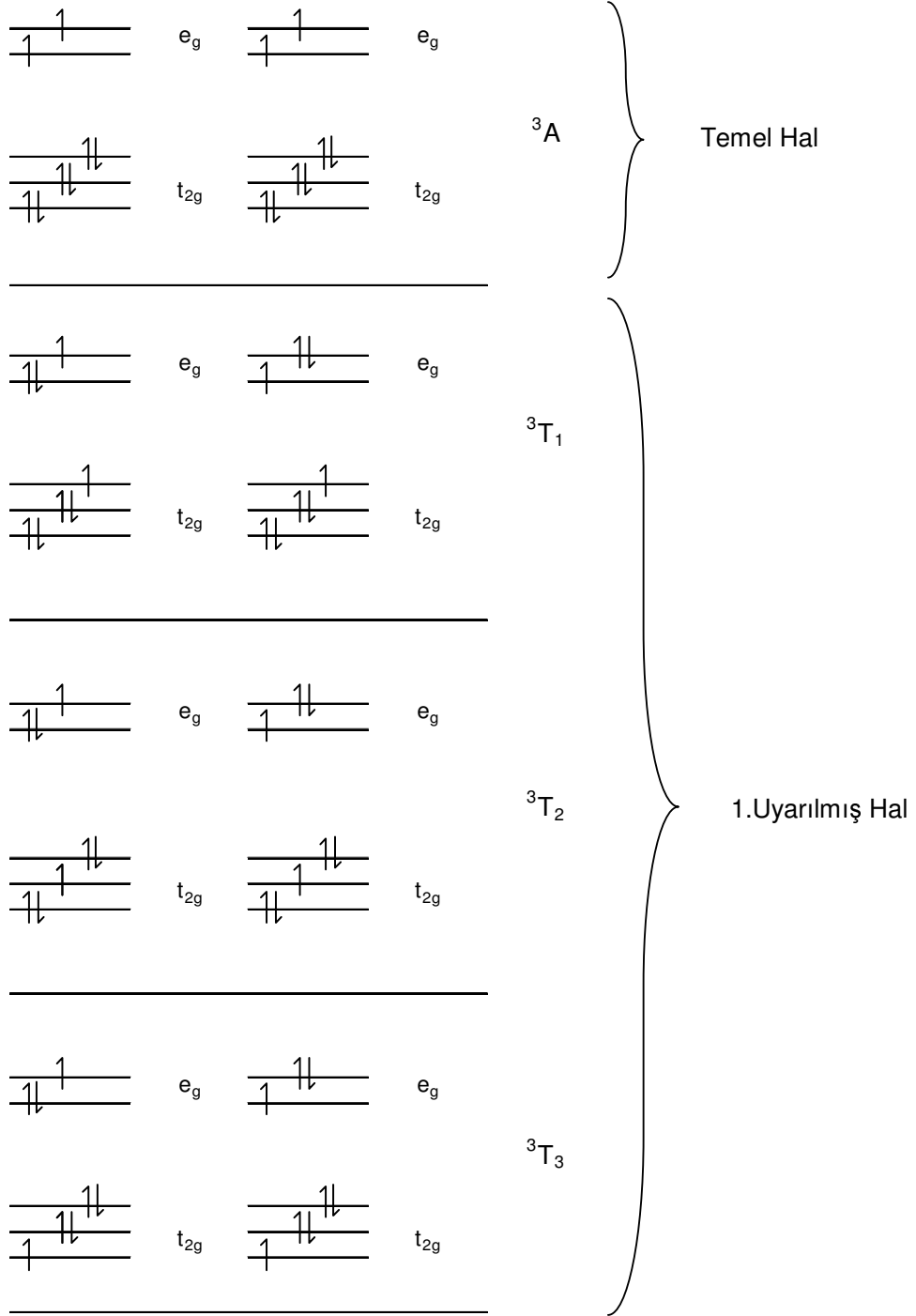
Temel halde tek durum sözkonusudur.

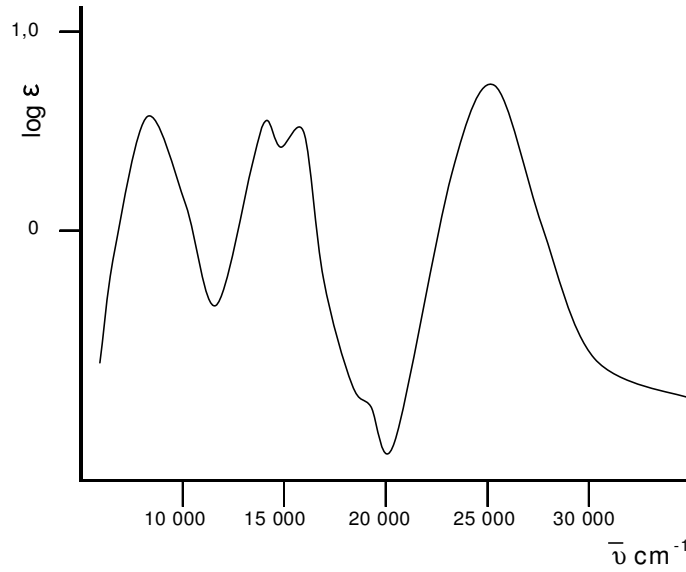
1.Uyarılmış halde t_{2g} de bulunan elektronlardan biri e_g enerji düzeyine geçer. Bunun için 3 eş enerjili durum sözkonusudur.

$$\text{Çok katlılık} = 2s + 1 = 2 \cdot 2 \cdot (1/2) + 1 = 3$$

Tek'li A, İkili E, Üçlü T sembolü ile gösterilirse;

Temel halde 3A ve 1.Uyarılmış halde ${}^3T_1, {}^3T_2, {}^3T_3$ sembolleri ile gösterebiliriz.





Ni²⁺'nin üç elektron geçişine ait alınmış elektronik spektrumları

1. Pik Değerinin Bulunması

$$\nu'_3 = \frac{3}{2} \Delta'_0 + \frac{15}{2} + \frac{1}{2} [(15)^2 - 18\Delta'_0 + 18\Delta_0'^2]^{1/2}$$

$$\nu'_2 = \frac{3}{2} \Delta'_0 + \frac{15}{2} - \frac{1}{2} [(15)^2 - 18\Delta'_0 + 18\Delta_0'^2]^{1/2}$$

Δ'_0	ν'_3	ν'_2	ν'_2 / ν'_3
0	15	0	0
2	17,44622199	3,553778005	0,203699002
4	20	7	0,35
6	22,68465844	10,31534156	0,454727656
8	25,52079729	13,47920271	0,528165424
10	28,52079729	16,47920271	0,577796004
12	31,68465844	19,31534156	0,609611797
14	35	22	0,628571429
16	38,44622199	24,55377801	0,638652558
18	42	27	0,642857143
20	45,6394103	29,3605897	0,643316588
22	49,34590301	31,65409699	0,64147366
24	53,10468636	33,89531364	0,638273493
26	56,90432602	36,09567398	0,634322142
28	60,73610253	38,26389747	0,630002517
30	64,59338662	40,40661338	0,625553412

$$\nu_2 / \nu_3 = 17605,63 / 29585,79 = 0,5950$$

Tablodan Δ'_0 değerine karşılık gelen ν'_2 değeri 19,31 olur.

$$\Delta'_0 = 12 \text{ olur.}$$

$$\lambda_2 = 568 \text{ nm} = 568 \times 10^{-7} \text{ cm}$$

$$\nu_2 = 1 / \lambda_2 = 1 / 568 \times 10^{-7} = 17605,63 \text{ cm}^{-1}$$

$$\nu_2 = 17605,63 \text{ cm}^{-1}$$

$$\lambda_3 = 338 \text{ nm} = 338 \times 10^{-7} \text{ cm}$$

$$\nu_3 = 1 / \lambda_3 = 1 / 338 \times 10^{-7} = 29585,79 \text{ cm}^{-1}$$

$$\nu_3 = 29585,79 \text{ cm}^{-1}$$

Racah Parametresinin bulunması;

$$\nu'_2 = \nu_2 / \beta \Rightarrow \beta = \nu_2 / \nu'_2 = 911,736$$

$$\beta = 911,736$$

$$\nu'_1 = \nu_1 / \beta \Rightarrow \Delta'_0 = \nu'_1 = 12$$

$$\nu_1 = \beta \times \nu'_1 = 911,736 \times 12 = 10940,83 \text{ cm}^{-1}$$

$$\nu_1 = 10940,83 \text{ cm}^{-1}$$

$$\nu_1 = 1 / \lambda_1 \Rightarrow \lambda_1 = 1 / 10940,83 = 0,00009140 \text{ cm}$$

$$\lambda_1 = 0,00009140 \text{ cm} = 914 \times 10^{-7} \text{ cm}$$

$$\lambda_1 = \mathbf{914 \text{ nm}}$$

$$10Dq = 10940,83 \text{ cm}^{-1} \times (1 \text{ kJ.mol}^{-1} / 83,6 \text{ cm}^{-1})$$

$$10Dq = 130,87 \text{ kJ.mol}^{-1}$$