

**SINTESIS DAN KARAKTERISASI SENYAWA KOMPLEKS KOBALT(II)
DENGAN LIGAN 1,10-FENANTROLIN DAN ANION
TRIFLUOROASETAT**

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ABSTRAK

Penelitian senyawa kompleks Co(II) dengan ligan 1,10-fenantrolin dan anion trifluoroasetat bertujuan untuk mengetahui formula, sifat magnetik, spektrum elektronik, spektrum inframerah, difraktogram XRD, topografi permukaan, dan dekomposisi senyawa kompleks.

Senyawa kompleks disintesis dengan cara mencampurkan $\text{Co}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$ dalam pelarut akuades dan ligan 1,10-fenantrolin dalam pelarut etanol dengan perbandingan mol logam dan mol ligan adalah 1 : 3. Hasil pencampuran kedua larutan, ditambahkan anion CF_3COONa berlebih yang dilarutkan dalam akuades.

Hasil pengukuran AAS menunjukkan kadar kobalt sebesar 6,42%. Pengukuran daya hantar ekuivalen menunjukkan perbandingan muatan kation : anion adalah 2 : 1. Jadi, kemungkinan formula senyawa kompleks yang terbentuk adalah $[\text{Co}(\text{phen})_3](\text{CF}_3\text{COO})_{2,4,5}\text{H}_2\text{O}$. Kurva TGA menunjukkan dekomposisi CF_3COO^- pada suhu 200-295°C sejumlah 1,981 molekul dan 1,10-fenantrolin pada suhu 295-500°C sejumlah 2,608 molekul. Perhitungan momen magnetik menunjukkan kompleks bersifat paramagnetik dengan nilai μ_{eff} 4,78 – 4,80 BM mengindikasikan geometri oktahedral. Pengukuran spektrum UV-Vis menunjukkan adanya dua pita serapan pada panjang gelombang 499 nm ($20040,08 \text{ cm}^{-1}$) yang merupakan transisi elektronik ${}^4\text{T}_{1g} \rightarrow {}^4\text{A}_{2g}$ dan pada panjang gelombang 455 nm ($21978,02 \text{ cm}^{-1}$) yang merupakan transisi elektronik ${}^4\text{T}_{1g} \rightarrow {}^4\text{T}_{1g}$. Spektrum inframerah menunjukkan serapan khas 1,10-fenantrolin dan anion trifluoroasetat. Hasil analisis difraktogram XRD menyarankan bahwa kompleks $[\text{Co}(\text{phen})_3](\text{CF}_3\text{COO})_{2,4,5}\text{H}_2\text{O}$ mempunyai sistem kristal triklinik dengan *space group* $\text{P}\bar{1}$ dengan parameter $a = 12,398306 \text{ \AA}$; $b = 13,452326 \text{ \AA}$; $c = 14,323069 \text{ \AA}$; $\alpha = 76,358086^\circ$; $\beta = 67,329613^\circ$; $\gamma = 70,761269^\circ$; $V = 2064,905029$; $R_p = 2,01$; $R_{wp} = 3,11$; dan $Gof = 2,646$.

Kata Kunci : Sintesis, karakterisasi, $[\text{Co}(\text{phen})_3](\text{CF}_3\text{COO})_{2,4,5}\text{H}_2\text{O}$, 1-10-fenantrolin, anion trifluoroasetat

**SYNTHESIS AND CHARACTERIZATION OF COBALT(II)
COMPLEXES WITH 1,10-PHENANTHROLINE LIGAND
AND TRIFLUOROACETATE**

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ABSTRACT

This research was purpose to know the formula, magnetic properties, electronic spectrum, infrared spectrum, XRD diffractogram, surface topography, and decomposition of the complex cobalt(II).

The complexes has been synthesized by mixing $\text{Co}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$ in aquadest solvent and 1,10-phenanthroline ligand in ethanol solvent in 1 : 3 mole of ratio. The result of solution was added by exceed CF_3COONa anion in aquadest.

The result complexes was measured with AAS and the cobalt was 6,42%. The measurement of electrical conductivity showed the charge ratio of cation : anion was 2 : 1. Thus, the possibility of complex compound formed is $[\text{Co}(\text{phen})_3](\text{CF}_3\text{COO})_2 \cdot 4,5\text{H}_2\text{O}$. The curve of TGA showed the decomposition of CF_3COO^- anion at 200-295°C is 1,981 molecules and 1,10-phenanthroline at 295-500°C is 2,608 molecules. The calculation of magnetic moment showed that this complex was paramagnetic with value of μ_{eff} 4,78 – 4,80 BM indicated octahedral geometry. The calculation of UV-Vis spectrum should showed two absorbtion band concentrated at wave number of 499 nm (20040,08 cm^{-1}) correspond to the transition ${}^4\text{T}_{1g} \rightarrow {}^4\text{A}_{2g}$ and at wave number 455 nm (21978,02 cm^{-1}) correspond to the transition ${}^4\text{T}_{1g} \rightarrow {}^3\text{T}_{1g}$. The infrared spectrum showed absorbtion band of 1,10-phenanthroline ligand and trifluoroacetate anion. The result of XRD diffractogram suggested that $[\text{Co}(\text{phen})_3](\text{CF}_3\text{COO})_2 \cdot 4,5\text{H}_2\text{O}$ has triclinic crystal with space group was $\text{P}\bar{1}$ and value of $a = 12,398306 \text{ \AA}$; $b = 13,452326 \text{ \AA}$; $c = 14,323069 \text{ \AA}$; $\alpha = 76,358086^\circ$; $\beta = 67,329613^\circ$; $\gamma = 70,761269^\circ$; $V = 2064,905029$; $R_p = 2,01$; $R_{wp} = 3,11$; and $\text{GOF} = 2,646$.

Keyword : Synthesis, characterization, $[\text{Co}(\text{phen})_3](\text{CF}_3\text{COO})_2 \cdot 4,5\text{H}_2\text{O}$, 1-10-phenanthroline, trifluoroacetate anion