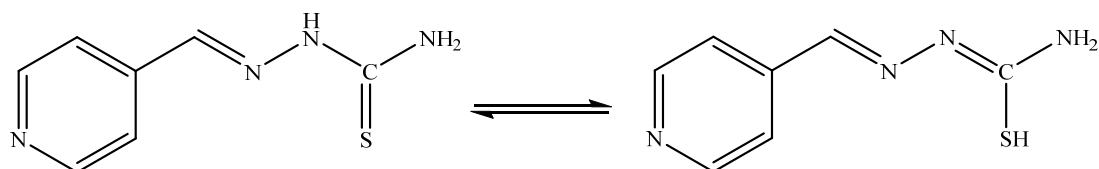


Supporting information

Investigation of L ligand

In many carbazone ligands, enol-ketone tautomerization occurs. By tautomerization, hydrogen can bind to sulfur on a nitrogen atom adjacent to thiocarbonyl ligand, and the ligand becomes negatively charged. As shown in Scheme S1, this tautomerization can also take place in the L ligand, and as a result, the bonding of the ligand to the enolate form is observed in the formation of the complex.



Scheme S1. Enol-ketone tautomerization of Schiff base L ligand.

Some physical characteristics of L ligand are given in Table S1.

Table S1. Some physical characteristics of L ligand

compound	Molecular formula	Molar mass	color	Melting point	Yield (%)
L	C ₇ H ₈ N ₄ S	180 g/mol	cream	200	80%

The obtained ligands were identified using FT-IR spectroscopy. Figure S1 shows the FT-IR spectrum of L ligand.

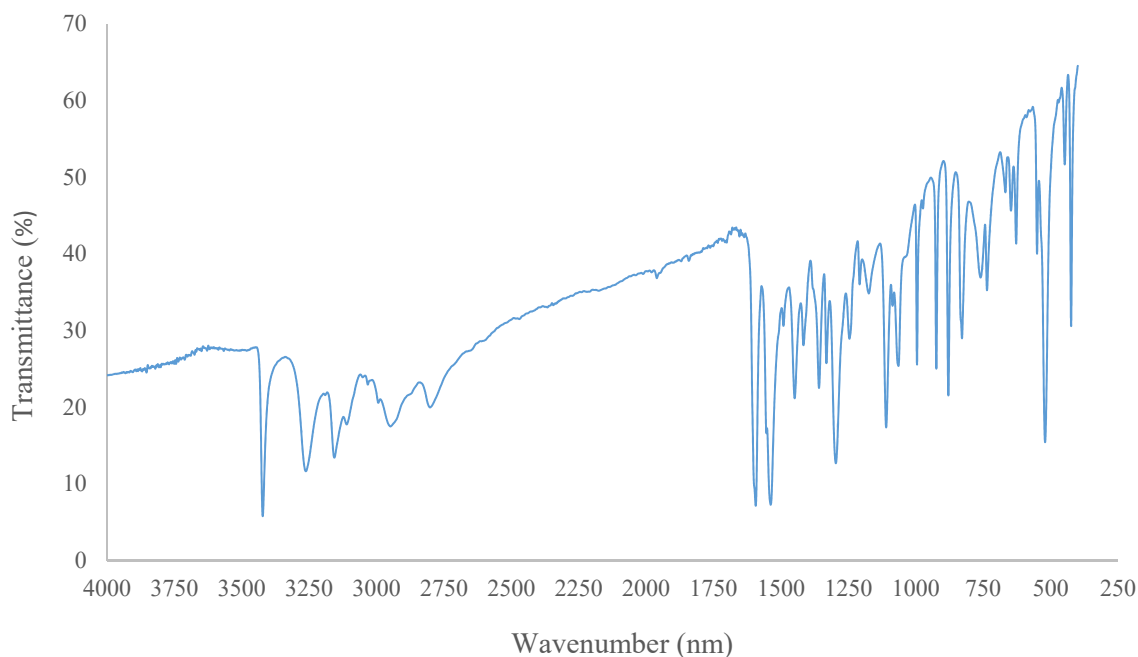
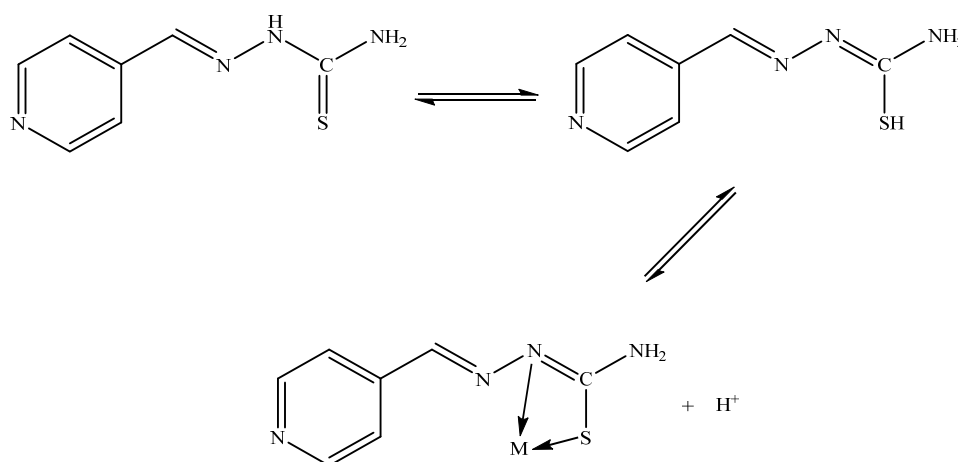


Figure S1. FT-IR spectrum of L ligand.

The results of FT-IR spectroscopy show that the band related to the amine tensile vibration for the L ligand in the region of 3425.98 cm^{-1} is observed as a sharp band. The most important band observed in the spectrum of Schiff base L ligands belongs to the imine functional group and the hydrogen on the nitrogen atom N³ of the ligands. Observing the band related to imine is proof of the formation of a Schiff base product. The band corresponding to the imine $\nu_{\text{C=N}}$ for the L ligand is seen as a sharp band in the region of 1602.13 cm^{-1} .

Due to the structure of the synthetic ligand and the observation of a hydrogen atom attached to the nitrogen of the thiosemicarbazide, it is expected that this ligand will act as a neutral ligand by retaining this hydrogen or acting as an anionic ligand by losing this hydrogen. The related band $\nu_{\text{N-H}}$.

For the L ligand a sharp band is observed in the 3162.34 cm^{-1} region. The peak corresponding to $\nu_{\text{C=S}}$ for the L ligand is observed in the region of 1703.36 cm^{-1} . Due to the structure of the synthetic ligand, it is expected that this ligand will act as a mono-dentate or di-dentate ligand. Scheme S2 shows the coordination method of the synthetic Schiff base ligand to the metallic ion.



Scheme S2. The coordination method of the L Schiff base ligand.