

Synthesis, Spectral Studies and Antibacterial Activity of Rare-Earth Metal Complexes with 1-Hydroxy-1-Phenyl-3-Allyl-2-Thiourea

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In the present work, the synthesis, spectral and antibacterial activity of rare-earth metal complexes with substituted thiourea are reported.

Thiourea derivatives have been widely used as therapeutic agents¹⁻³. Recently, intensive investigations were carried out in the synthesis and biological activity of heterocyclic compounds and their metal complexes. In the present work few metal complexes have been synthesised and screened for their possible antibacterial activity.

1-Hydroxy-1-phenyl-3-allyl-2-thiourea was prepared by condensing equimolar quantities of phenylhydroxylamine and allylisothiocyanate in ether^{4,5}.

The metal complexes were prepared by refluxing 1-hydroxy-(1-phenyl)-3-allyl-2-thiourea (HPAT) solution with respective metal nitrate solution (0.05 m in 15 ml ethanol) for about 5 h.

The coloured solids so separated were filtered, washed with water, extract and dried *in vacuo*.

Metal content was estimated by EDTA titrations. Infrared spectra were recorded on Beckman IR-12 spectrophotometer in KBr disc. Toshniwal conductivity bridge was used to determine the electrical conductance on 10^{-3} in solutions in DMSO.

The microanalytical results reveal that these complexes have the composition $[M(HPAT)_2NO_3]$ where $M = Sm^{3+}, Gd^{3+}, Y^{3+}$

The IR spectra of ligand shows bands around $3270-3230\text{ cm}^{-1}$ due to N-H stretching vibration. In the case of metal complexes these bands have been observed in the range $3240-3200\text{ cm}^{-1}$. Bands due to $\nu(N-C-N)$ and $\nu(C=S)$ are observed in the region $1510-1475\text{ cm}^{-1}$ and $1210-1200\text{ cm}^{-1}$ respectively. In case of metal complexes bands assignable to $\nu(C=S)$ have been shifted to lower frequencies indicating that sulphur atom of the ligand is involved in bonding.

The antibacterial activity was carried out using cup-plate method at a concentration of 500 g.ml^{-1} in DMF against *Streptococci*, *Staphylococci*, *E. coli*, *Proteus* and *Pseudomonas* species. The results are shown in Table 1. All the metal complexes showed good antibacterial activity against *E. Coli*, *Proteus* and

Staphylococci species where as *Streptococci* and *Pseudomonas* species were found resistant.

TABLE I
ANTIBACTERIAL ACTIVITY OF METAL COMPLEXES OF 1-HYDROXY-1-PHENYL-3-ALLYL-2-THIOUREA

| Compound | <i>E. coli</i> | <i>Proteus</i> <i>sp.</i> | Activity (Zone of Inhibition) | | <i>Staphylococci</i> <i>sp.</i> |
|--|----------------|------------------------------|----------------------------------|-----------------------------------|------------------------------------|
| | | | <i>Pseudomonas</i> <i>sp.</i> | <i>Streptococci</i> <i>sp.</i> | |
| Gd (HPAT) ₂ NO ₃ | + | | - | - | ++ |
| Sm (HPAT) ₂ NO ₃ | + | | - | - | ++ |
| Y (HPAT) ₂ NO ₃ | ++ | | - | - | ++ |

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