

SYNTHESIS AND CHARACTERIZATION OF VANADIUM(IV)-FLAVONOID COMPLEX AND ITS RADICAL SCAVENGING PROPERTIES TOWARDS SUPEROXIDE FREE RADICAL

ABSTRACT

In this project, VO(3OH-6M-Fl)₂ complex was synthesized using vanadium(IV) acetylacetonate (VO(acac)₂) and 3-hydroxy-6-methylflavone (3OH-6M-Fl). The complex stoichiometry and stability were checked using FTIR and UV-vis spectroscopies along with elemental (C, H) analysis. V=O peak around 990 cm⁻¹ in IR spectrum along with shifted ligand-based peaks confirm the coordination of V(IV) with the ligand in a bidentate fashion. In UV-Vis spectrum peaks around 400-450 nm were observed that correspond to the ligand to metal charge transfer (LMCT) transitions. The radical scavenging ability of newly synthesized complex along with other vanadium complexes were investigated using DPPH (2,2-diphenyl-1-picrylhydrazyl). The synthesized complex exhibits strong radical scavenging activity compared to VO(acac)₂ and BHA (butyl hydroxyanisole), with IC₅₀ value of (105, 95 and 96) mM, respectively.

OBJECTIVES

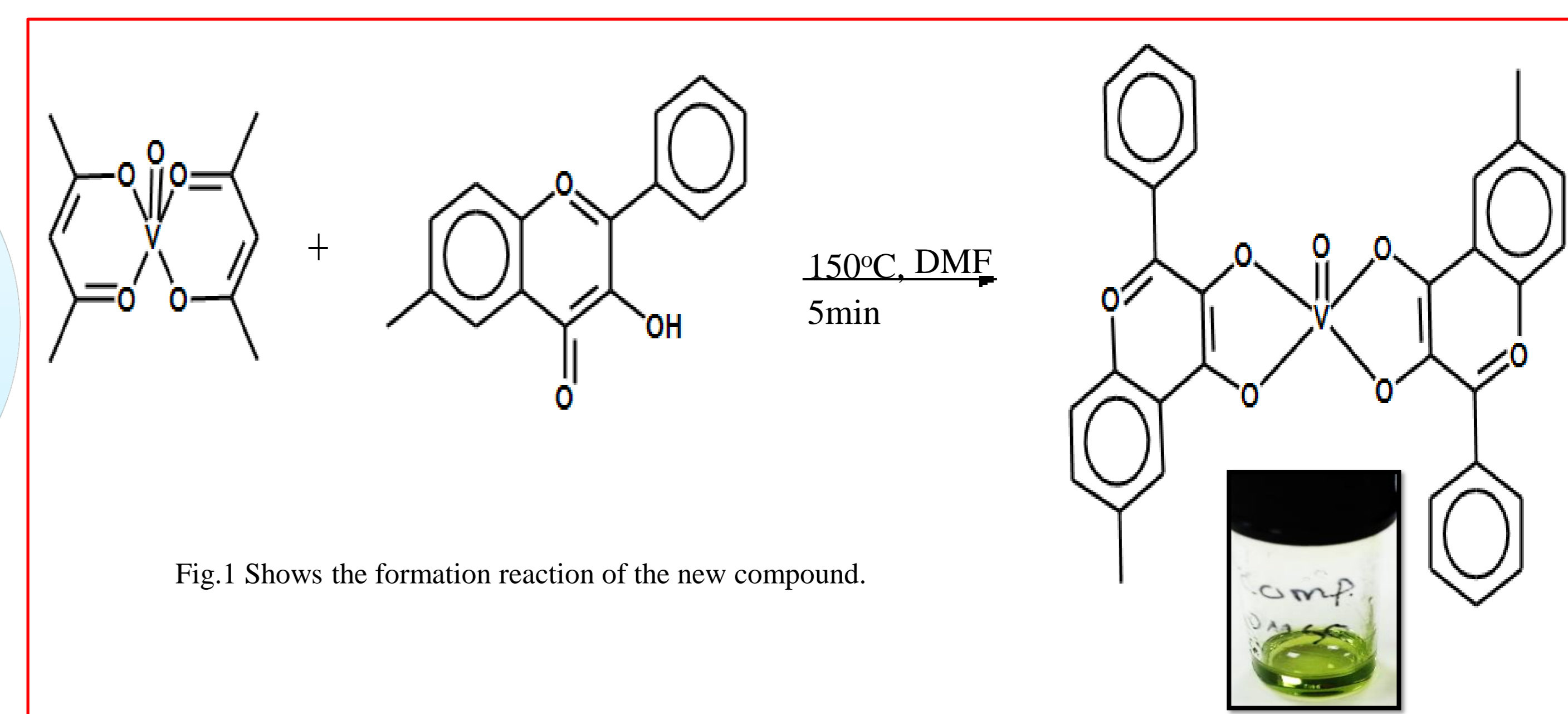
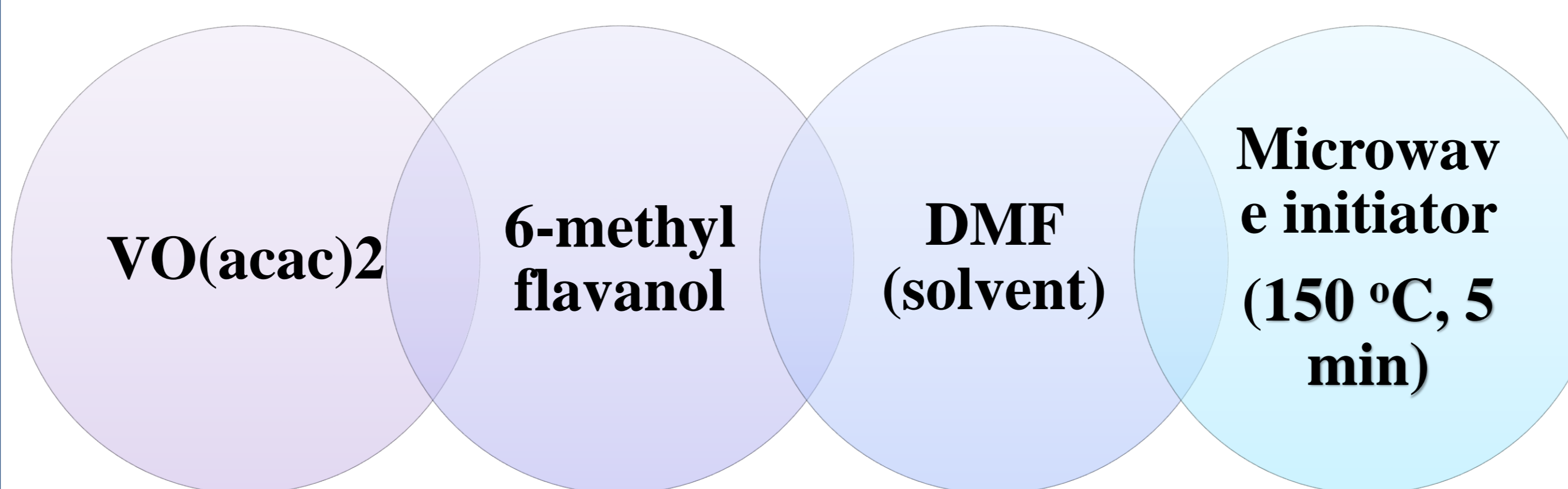
- To synthesis, characterization and to study the stability of vanadium (IV)-flavonoid complexes using FTIR and UV-Vis.
- To investigate the anti-oxidant and radical scavenging ability of the complex.

LITERATURE REVIEW

Flavonoids are considered as good chelating ligands especially the ones that are having hydroxyl group in one or more of their rings can interact with metals. Some recent research suggested that the presence of OH group in the position 3 or 5 on the ring can have a better chelating effect than being in ortho position on the ring (P.G. Pietta, 2000). DPPH assay is a standard radicle assay that is stable in solution and possess a purple colour at 517nm absorbance in ethanol. The main role of DPPH is to accept a hydrogen atom (H) donated by the scavenger complexes or the antioxidant molecule, resulting in the reduction of DPPH to DPPH₂, the purple colour change to yellow and the absorbance decreases as a result (M.S. Blois, 1958).

METHODOLOGY

Step one was the synthesis:



RESULTS and DISCUSSION

IR Spectroscopy

The IR test was used to assign the peaks of the functional groups, to investigate the formation of product.

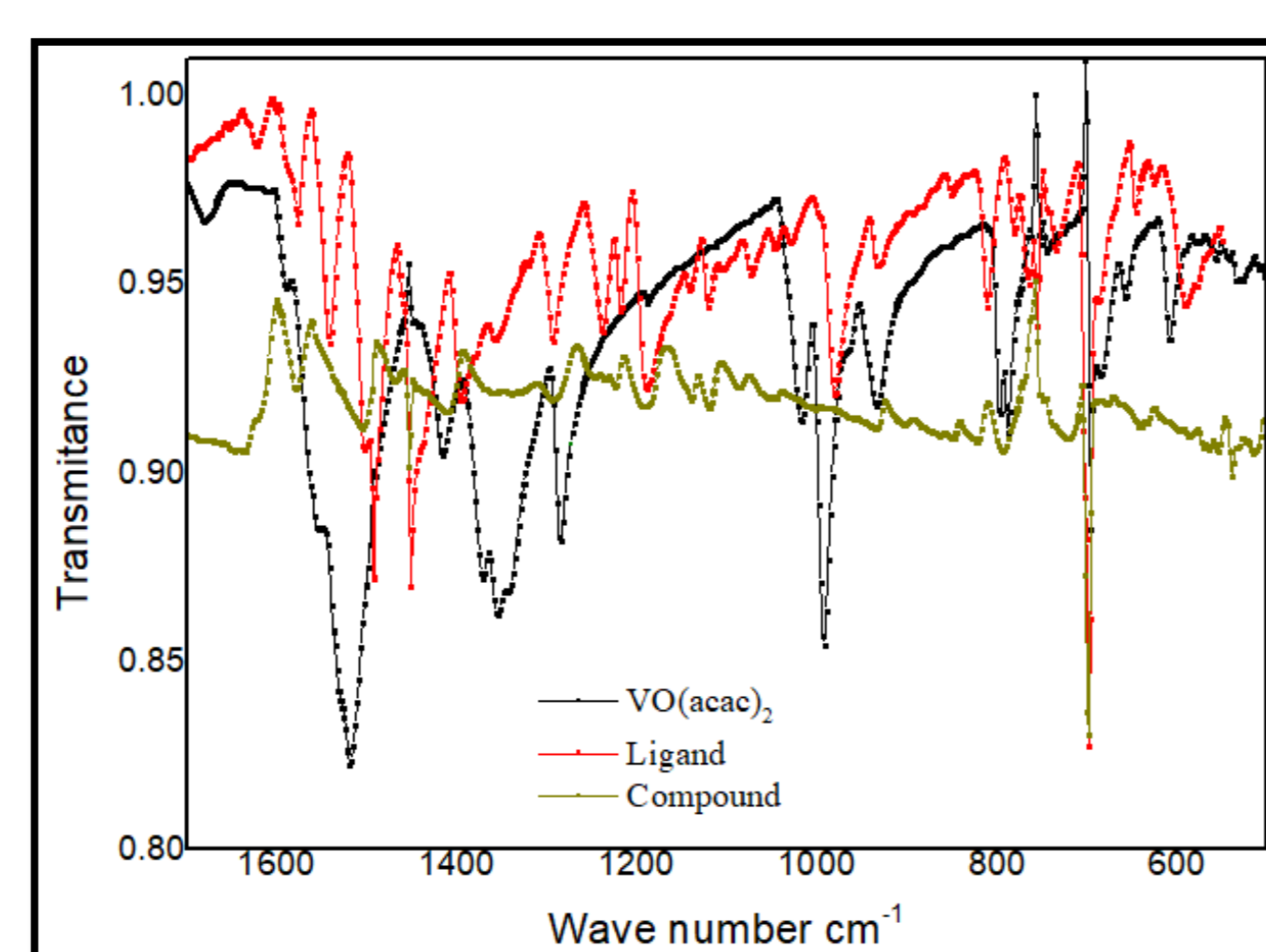


Fig.2 shows the FTIR spectrum of the starting materials and the newly synthesised compound in region of 1700-500 cm⁻¹.

Table.1 shows the functional group of VO(acac)₂, Ligand and compound.

Functional group	Frequency cm ⁻¹
VO(acac)₂	
V=O	980 - 996
C=O	1518 -1555
C=C	2000-2500
C-H	2928-3027
Ligand	
C=O	1545-1570
C=C	2354-2486
C-H	2600-3019
O-H	3332-3581
Compound	
V-O	790-810
V=O	980 - 996
C=O	1450-1575
C=C	2354-2578
C-H	2922-3076

UV-Vis Analysis

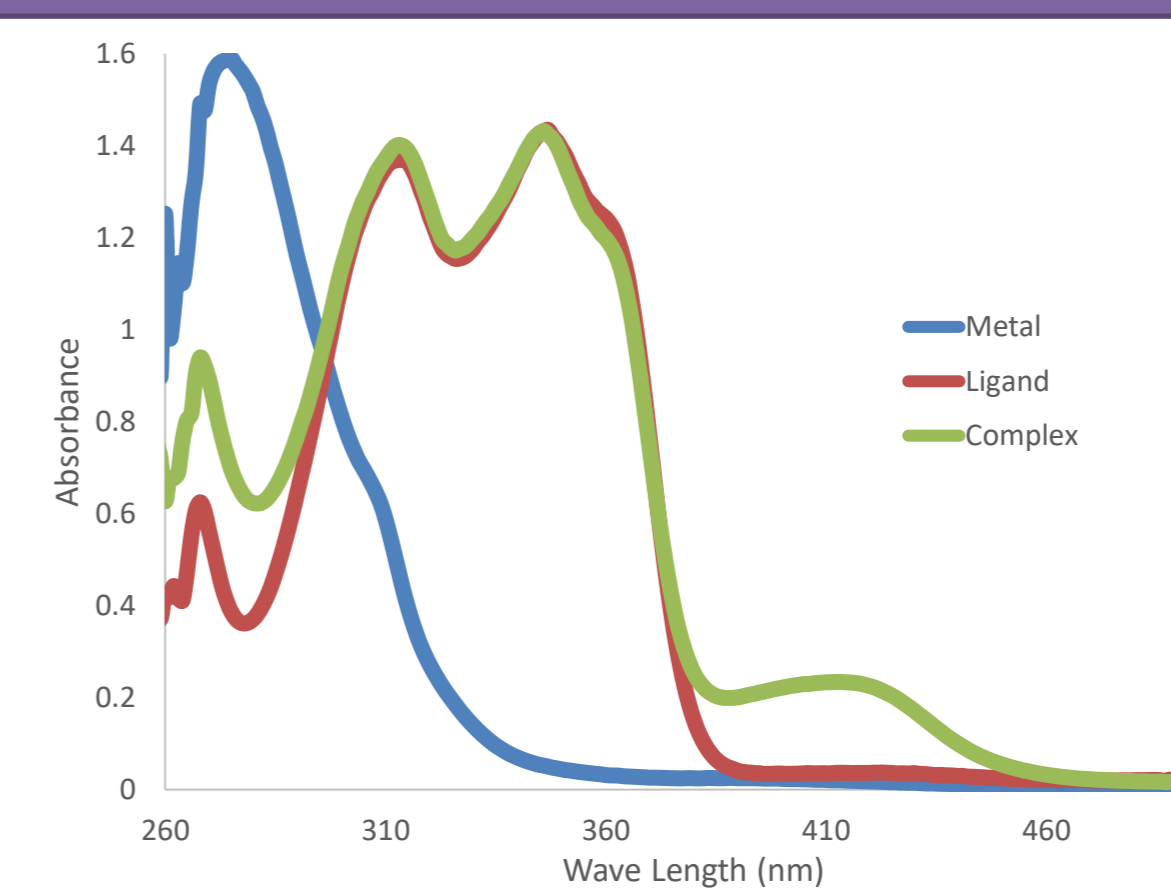


Fig.5 Shows the UV-vis spectrum of VO(acac)₂, ligand and the synthesized complex in DMF.

VO(acac)₂ peaks are shown around 270nm, while the ligand and newly synthesized complex possess approximately the same peak positions and intensity around 310 and 350 nm, except the peak around 410-430 nm which correspond to the metal-ligand charge transfer (MLCT).

In DMSO the VO(acac)₂ peaks appears around 310nm, as for the ligand and complex, they retain the same peaks position but differs in the absorbance intensity, with an extra peak shown in the complex spectrum around 430nm, indicating the MLCT.

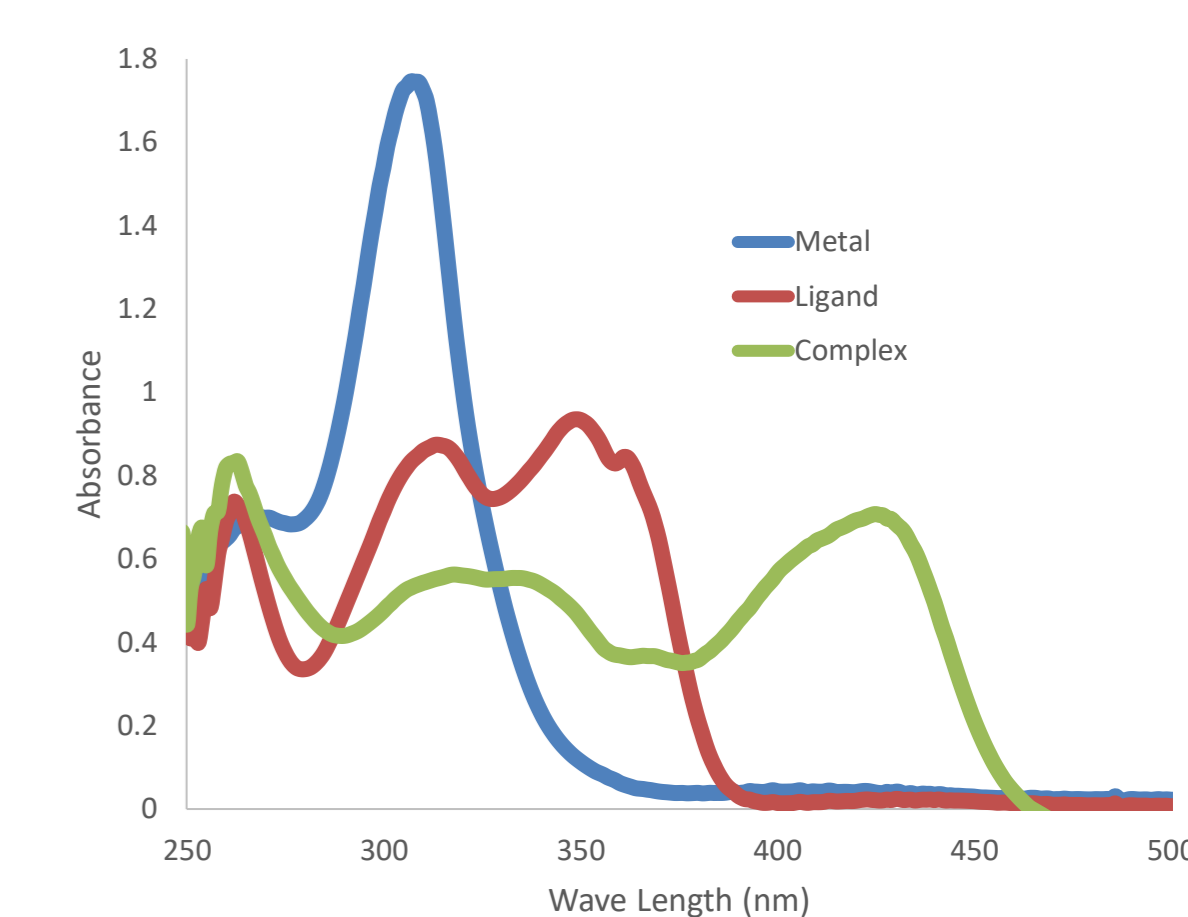


Fig.6 Shows the UV-vis spectrum of VO(acac)₂, ligand and the synthesized complex in DMSO.

Radical scavenging

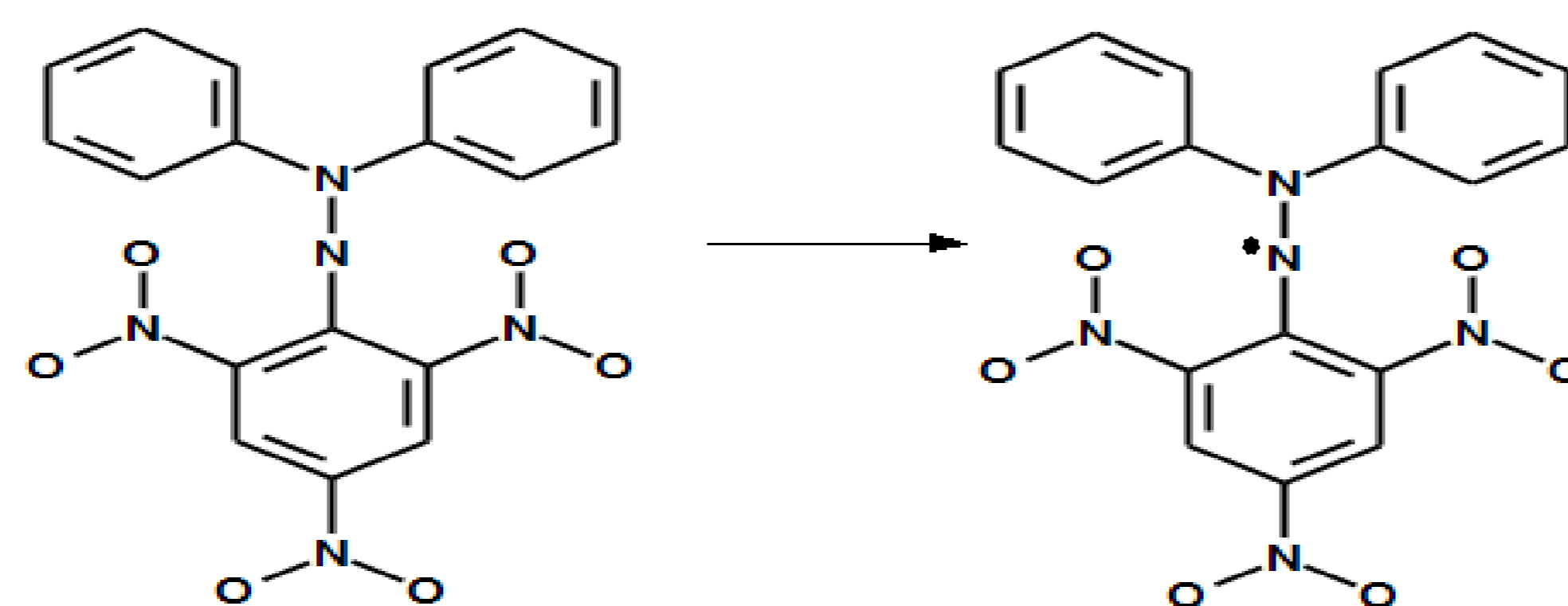


Fig.3 The DPPH complex before and after the reduction by anti-oxidant compounds

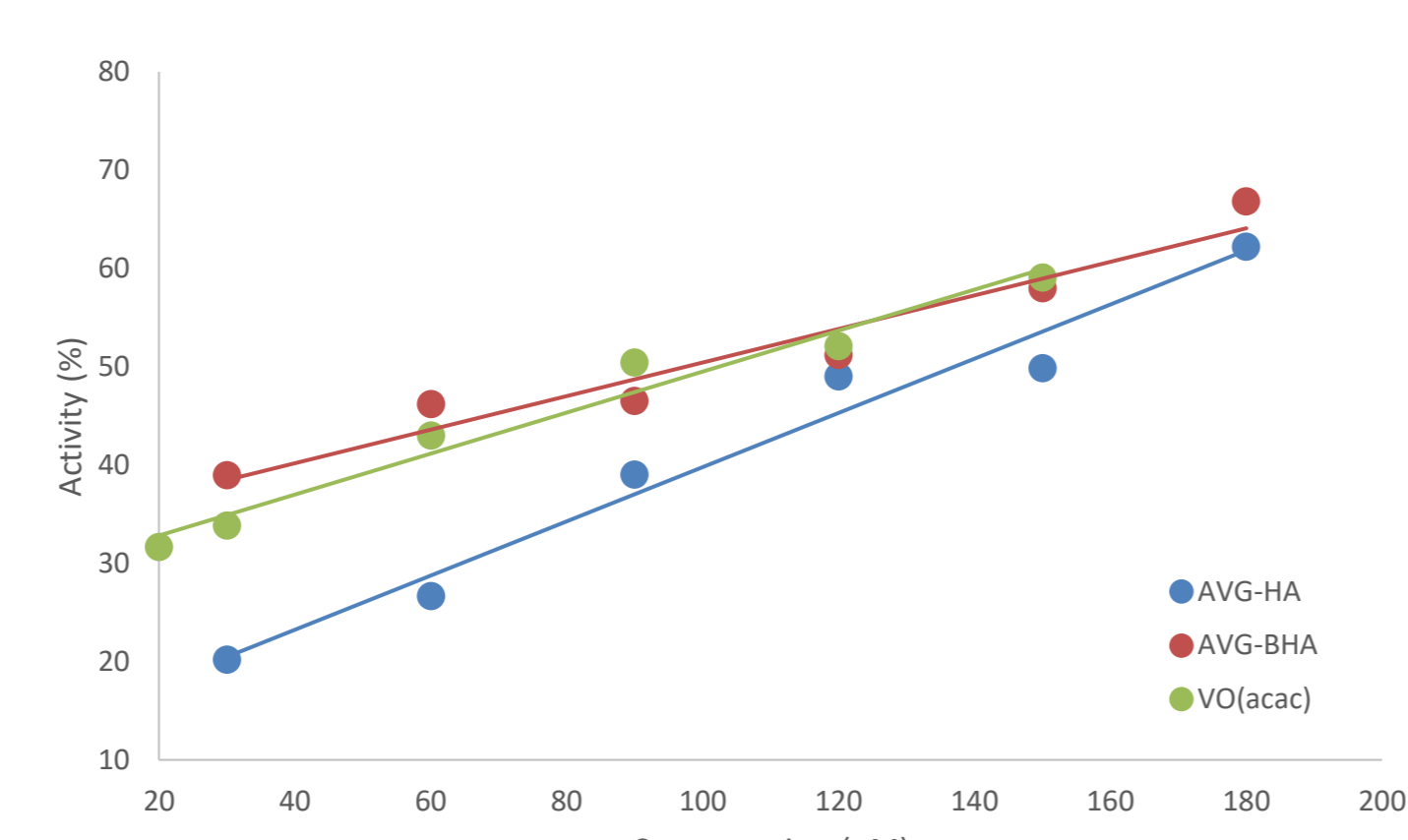


Fig.4 Shows the DPPH free radical scavenging activity of standard BHA, Vo(acac)₂ and the Complex.

The IC₅₀ of the complex, VO(acac)₂ and BHA were found to be (105, 95 and 96) µM, respectively.

CONCLUSION

In FTIR spectrum the main functional groups especially V=O peak around 900-1000cm⁻¹ is observed. Disappearance of -OH peak also indicated deprotonation of the -OH group and its coordination with metal centre. Based on the UV-vis spectra and comparison with literature, it might be suggested that the complex geometry could be a square pyramidal.

Radical scavenging studies show that metal complexes as well as metal salts possess scavenging/inhibition potential against superoxide radicals such as DPPH. The activity of these types of complexes is influenced by its nature and the substituted groups position on the ligands.

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