

Coordination compounds of Cu(II) and Ni(II) with 1-(morpholin-4-yl)propane-1,2-dione 4-allylthiosemicarbazone: a protection from free radical damage

Ianina Ulchina*¹, Vasilii Graur¹, Olga Garbuz^{1,2}, Victor Tsapkov¹, Aurelian Gulea¹

¹ Laboratory of Advanced Materials in Biofarmaceutics and Technics, Moldova State University, Chişinău, MD-2009, Republic of Moldova

² Institute of Zoology, Chişinău, MD-2028, Republic of Moldova

Corresponding author: ianina.ulchina@gmail.com

Introduction

Free radicals are highly reactive and unstable particles that are produced in the body during normal metabolic functions, or by exposure to toxins in the environment such as tobacco smoke and ultraviolet light. Free radicals have a lifespan of only a fraction of a second, but during that time can damage DNA, sometimes resulting in mutations that can lead to various diseases, including heart disease and cancer. The antioxidants can neutralize the unstable particles, reducing the risk of damage. So the design of new substances as a potent antioxidant is an actual problem in the modern world.

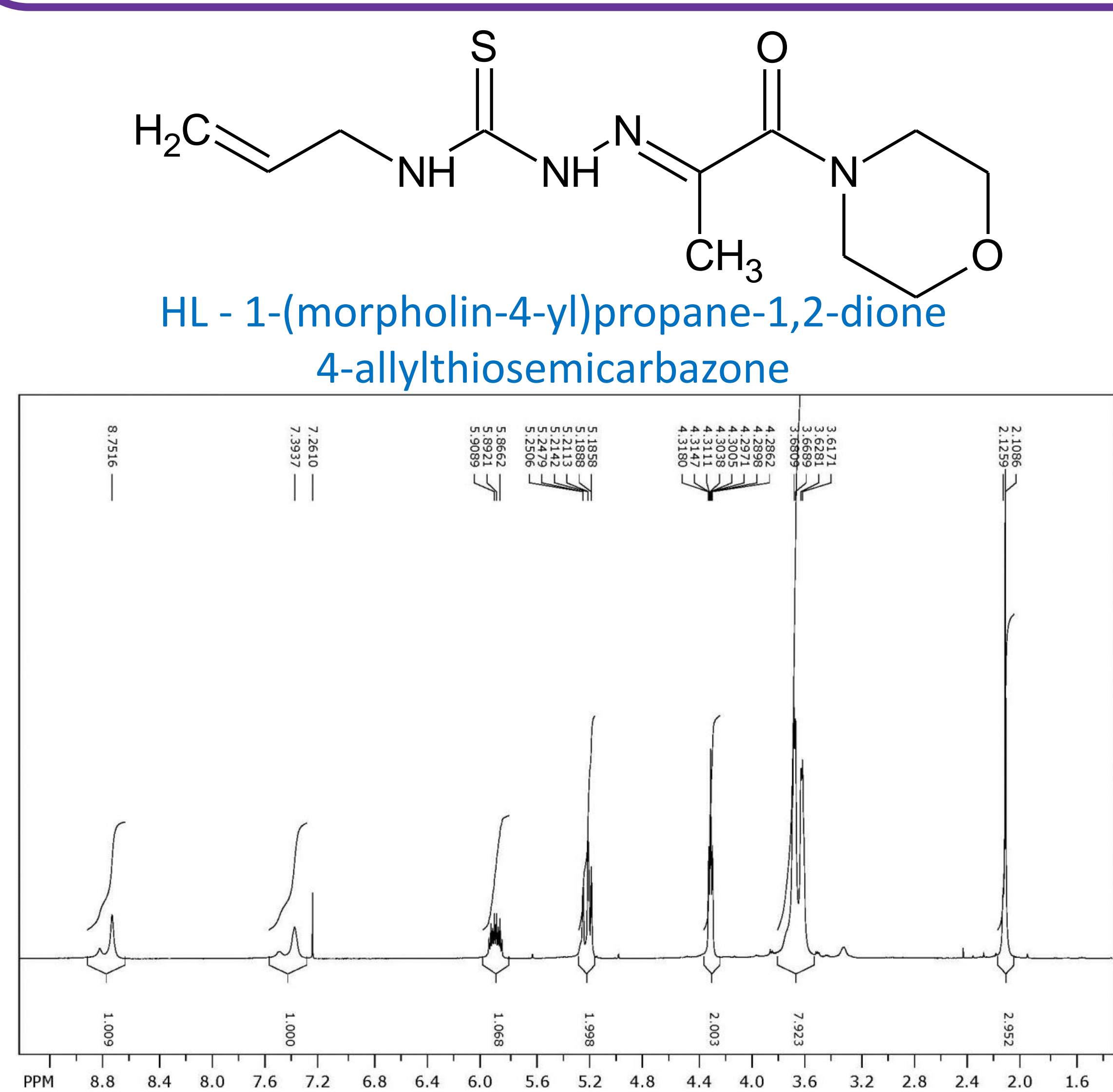
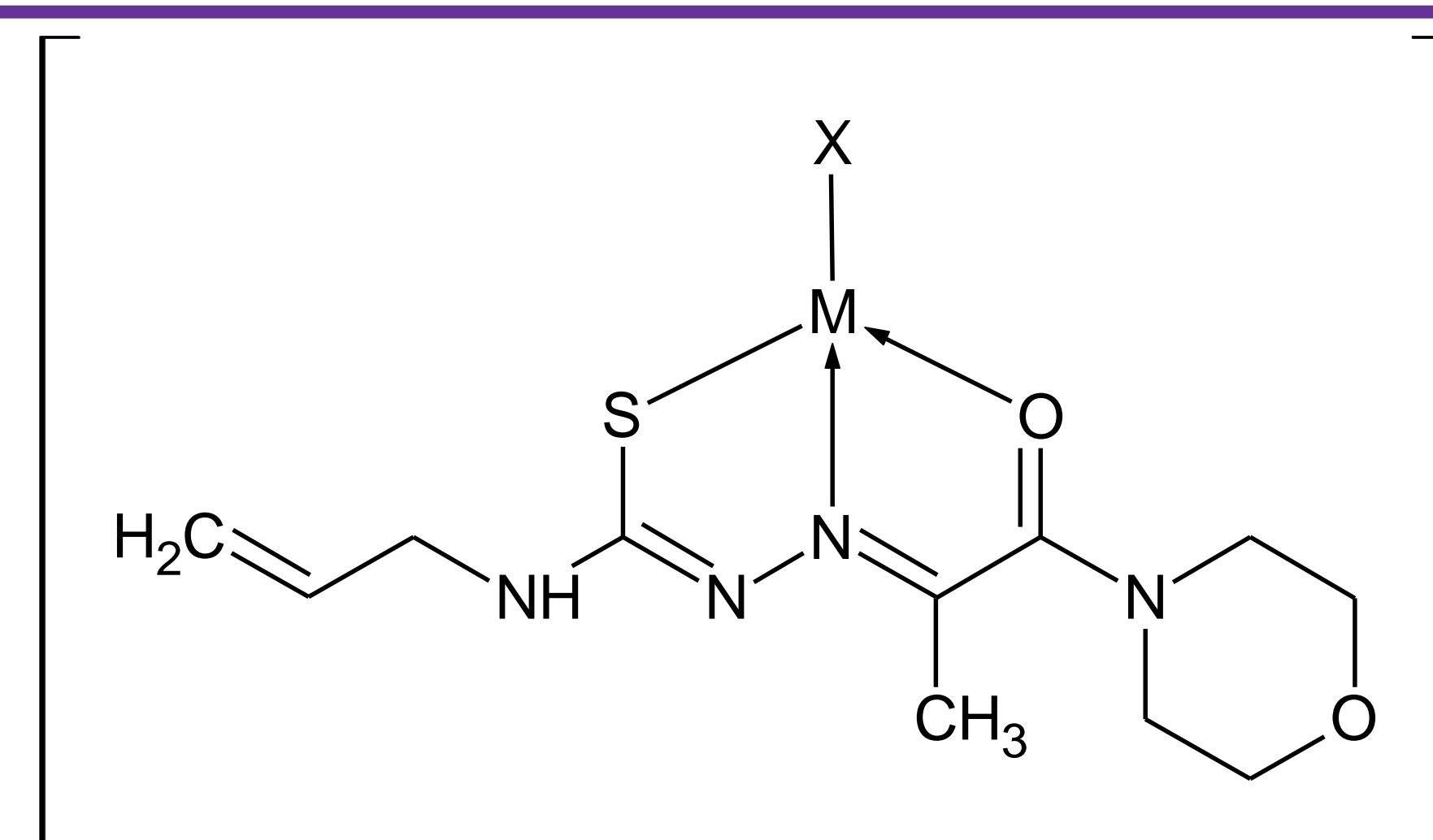
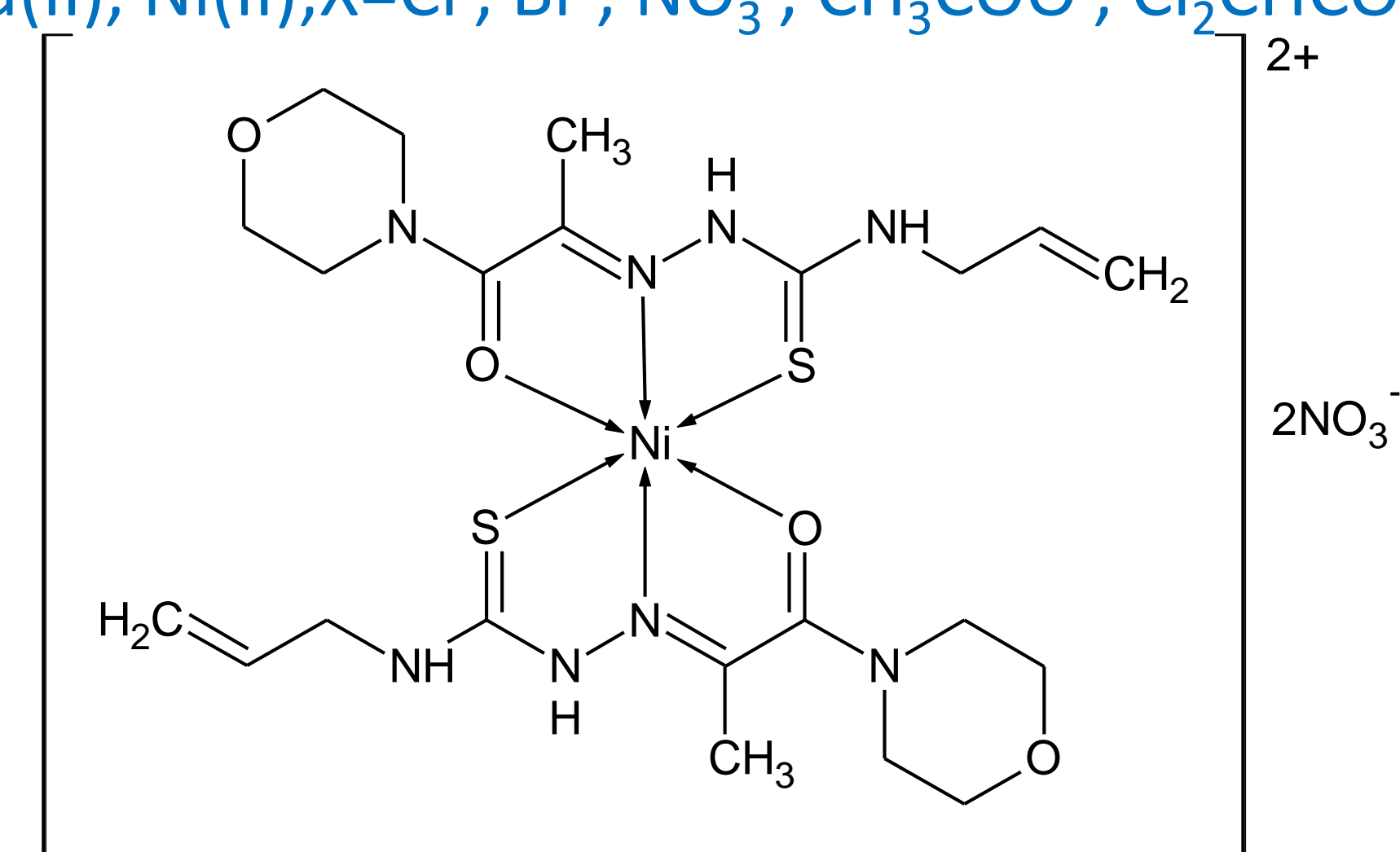


Fig.1 The ¹H NMR spectrum of 1-(morpholin-4-yl)propane-1,2-dione 4-allylthiosemicarbazone (HL)



The structural formulas of the complexes, where M-Cu(II), Ni(II); X=Cl⁻, Br⁻, NO₃⁻, CH₃COO⁻, Cl₂CHCOO⁻



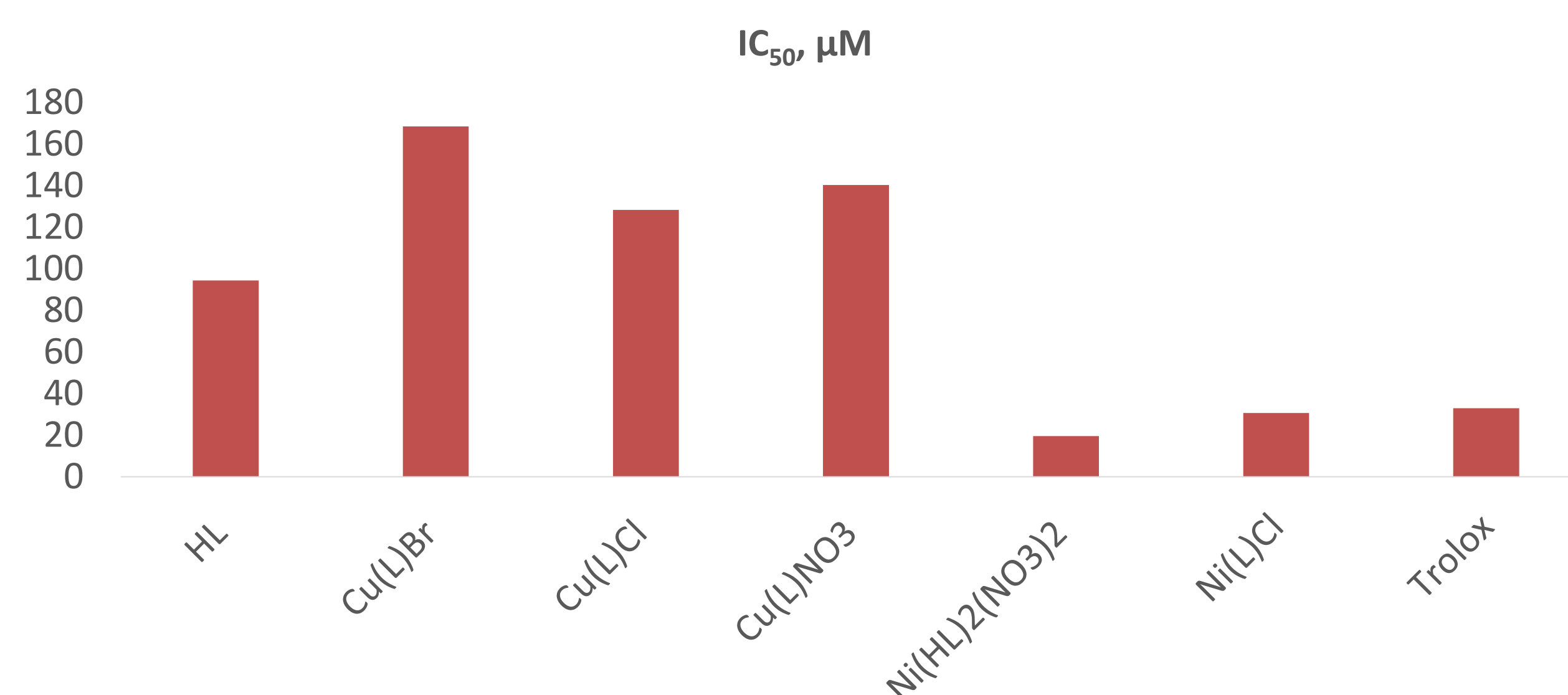
The structural formula of the Ni(HL)₂(NO₃)₂

Results

The coordination compounds of Cu(II) and Ni(II) with 1-(morpholin-4-yl)propane-1,2-dione 4-allylthiosemicarbazone (HL) were synthesized. HL (Fig. 1) was obtained by the condensation reaction between 1-(morpholin-4-yl)propane-1,2-dione and 4-allylthiosemicarbazide in the ethanol solution. Its structure and purity were proved using ¹H and ¹³C NMR spectroscopy. The coordination compounds were synthesized at the interaction of the ethanolic solutions of thiosemicarbazone and the metal salts in a molar ratio of 1:1 and 1:2. The composition of these compounds was determined using elemental analysis: Cu(L)X (X=Cl⁻, Br⁻, NO₃⁻, CH₃COO⁻, Cl₂CHCOO⁻), Ni(HL)₂(NO₃)₂, Ni(L)Cl. The composition of complexes was studied by some methods like molar conductivity and FTIR spectra.

Antioxidant activity

The study of antioxidant activity by a standard ABTS^{•+} method has shown that the most active compound is Ni(HL)₂(NO₃)₂. Its activity is 19.61 μM, that is more pronounced than the activity of the trolox, a water-soluble antioxidant which is used in medicine.



Conclusions

In this work the new 4-allylthiosemicarbazone and its complexes with Cu(II) and Ni(II) were synthesized and studied with different physical methods. The study of antioxidant activity showed that the most active one is complex Ni(HL)₂(NO₃)₂ and it outperforms trolox in activity, which makes it a promising antioxidant.

Acknowledgments

This work was fulfilled with the financial support of the ANCD project 20.80009.5007.10.

ECMC
2022

The 8th International Electronic
Conference on Medicinal Chemistry
01-30 NOVEMBER 2022 | ONLINE