O3 SES1

ACID-BASE PROPERTIES AND BINDING ABILITY OF AN ASPARTIC ACID DERIVATIVE OF 3-HYDROXY-4-PYRIDINONE TOWARDS BIOLOGICAL RELEVANT METAL CATIONS

A. Irto[1], P. Cardiano[1], K. Chand[2], R.M. Cigala[1], F. Crea[1], C. De Stefano[1], S. Sammartano[1], M.A. Santos[2]

[1]*Dipartimento di Scienze Chimiche, Biologiche, Farmaceutiche e Ambientali, Università di Messina, Messina, Italy*
[2]*Centro de Química Estrutural, Instituto Superior Técnico, Universidade de Lisboa, Lisboa, Portugal*

This contribution is the result of a speciation study in aqueous solution of a 3-hydroxy-4-pyridinone amino-acid derivative in the presence of two divalent metal cations of biological relevance, at different experimental conditions.
The 3-hydroxy-4-pyridinones (3,4-HP) are a class of compounds, derivatives of deferiprone, developed in view of applications in metal chelation therapy and for the detoxification of human body from *hard* metal cations (Fe^{3+}, Al^{3+}, etc.), because of their effectiveness at biological conditions, lows costs, oral activity, absence of toxicity and of side effects. They are featured by an aromatoid *N*-heterocycle with a hydroxyl and a ketone groups in *ortho* position, which confer them a strong affinity towards divalent and trivalent metal cations [1-3].
The ligand under study has a 3,4-HP core *N*-functionalized with an aspartic acid moiety. Its acid-base properties, previously studied at I = 0.15 mol L^{-1} in $NaCl_{(aq)}$ and T = 298.15 K and 310.15 K [3], were investigated by UV-Vis spectrophotometric measurements at the same ionic strength and T = 288.15 K, as well as at $0.50 \leq I$ / mol $L^{-1} \leq 1.00$ and T = 298.15 K. The speciation model obtained for the 3-hydroxy-4-pyridinone protonation was also confirmed by performing ^{1}H NMR titrations I = 0.15 mol L^{-1} in $NaCl_{(aq)}$ and T = 298.15 K.
The binding ability towards Ca^{2+} and Mg^{2+} was investigated using two analytical techniques, namely potentiometry (ISE-H^+) and UV-Vis spectrophotometry. The measurements were carried out at $0.15 \leq I$ / mol $L^{-1} \leq 1.00$ in $NaCl_{(aq)}$ and $288.15 \leq T$ / K ≤ 310.15.
The dependence on ionic strength of the thermodynamic parameters was modelled using an extended-type Debye-Hückel equation and the Specific Ion Interaction Theory (SIT), while the effect of temperature was studied by means of the Van't Hoff equation.
Furthermore, the sequestering ability of the ligand towards the metal cations under study was investigated by the determination, at different pH, ionic strength and temperature conditions, of the empirical parameter $pL_{0.5}$, already proposed by the research group. It represents the total concentration of ligand required to sequester the 50% of the metal cation present in trace in solution [4].

O3 SES1

References

[1] Santos M.A., Chaves S., Future Medicinal Chemistry, 2015, 7 (3) 383-410.
[2] Santos M.A., Coordination Chemistry Reviews, 2008, 252 (10–11) 1213-1224.
[3] Irto A., Cardiano P., Chand K., Cigala R.M, Crea F., De Stefano C., Gano L., Sammartano S., Santos M.A., Journal of Inorganic Biochemistry, 2018, 186, 116-129.
[4] Crea F., De Stefano C., Foti C., Milea D., Sammartano S., Current Medicinal Chemistry, 2014, 21, 3819-3836.