Electronic Supplementary Material (ESI) for Dalton Transactions.

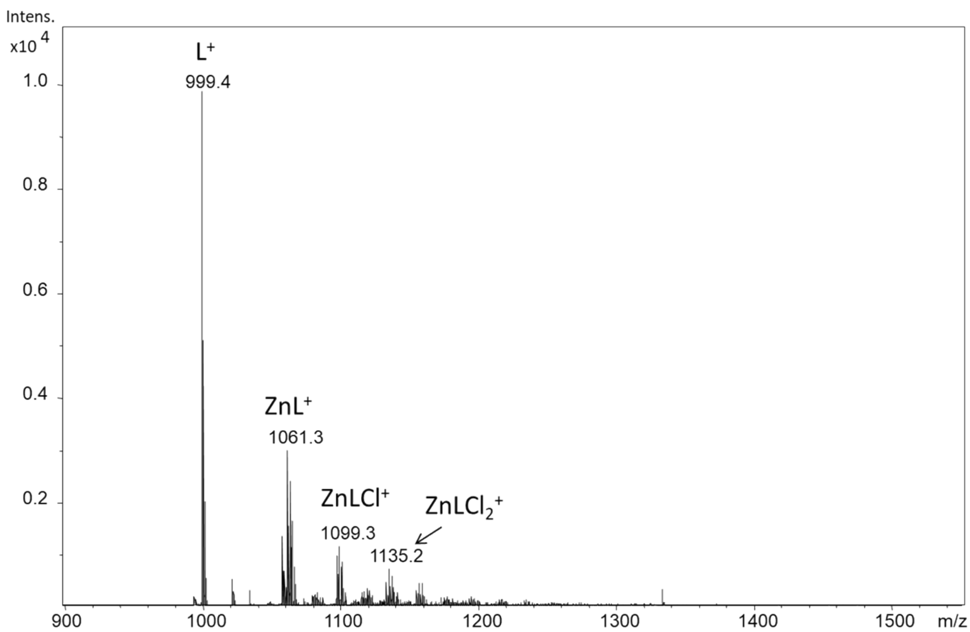
Candida albicans zincophore and zinc transporter interactions with Zn(II) and Ni(II)

D. Łoboda[a], M. Rowińska-Żyrek*[a]

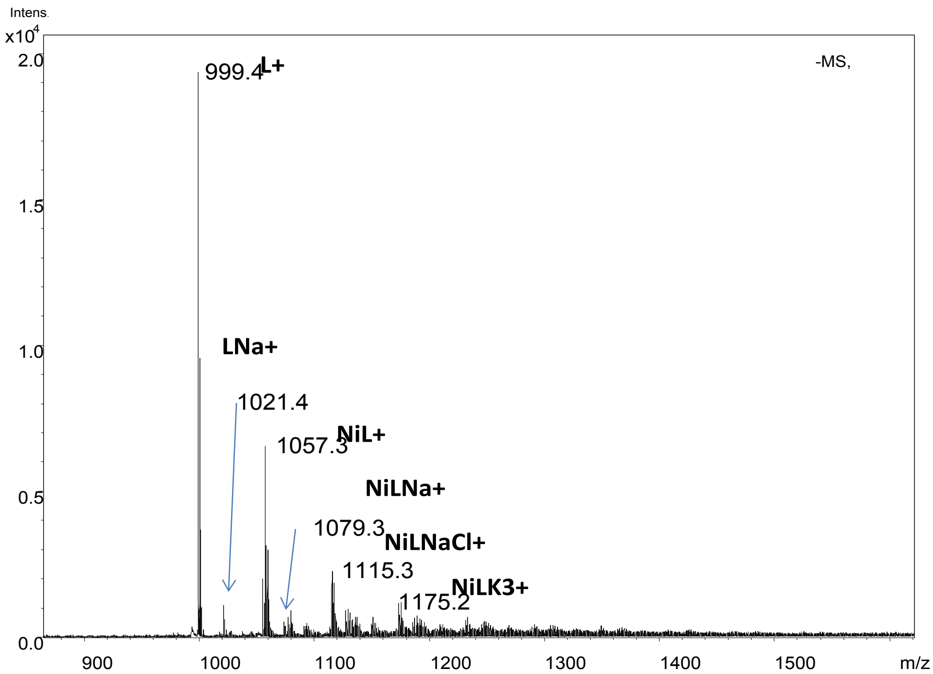
Faculty of Chemistry, University of Wroclaw, F. Joliot-Curie 14, 50383 Wroclaw, Poland

Figure S1. The alignment of Zrt1 and ZrfC sequences (from *C. albicans* and *A. fumigatus,* respectively; Uniprot accession numbers Q5A0Y4 and D3W9Z8). The two zinc transporters share 48% of identity.

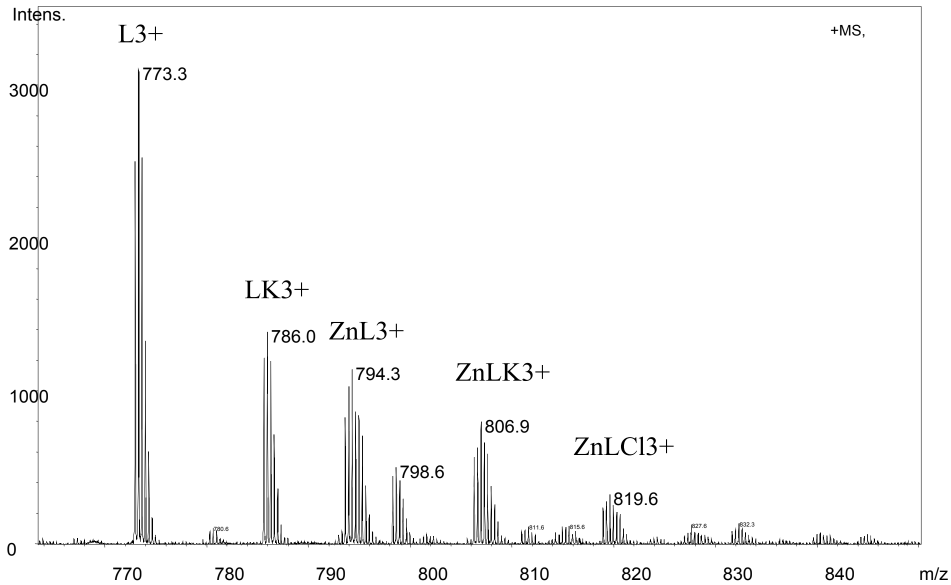
A)



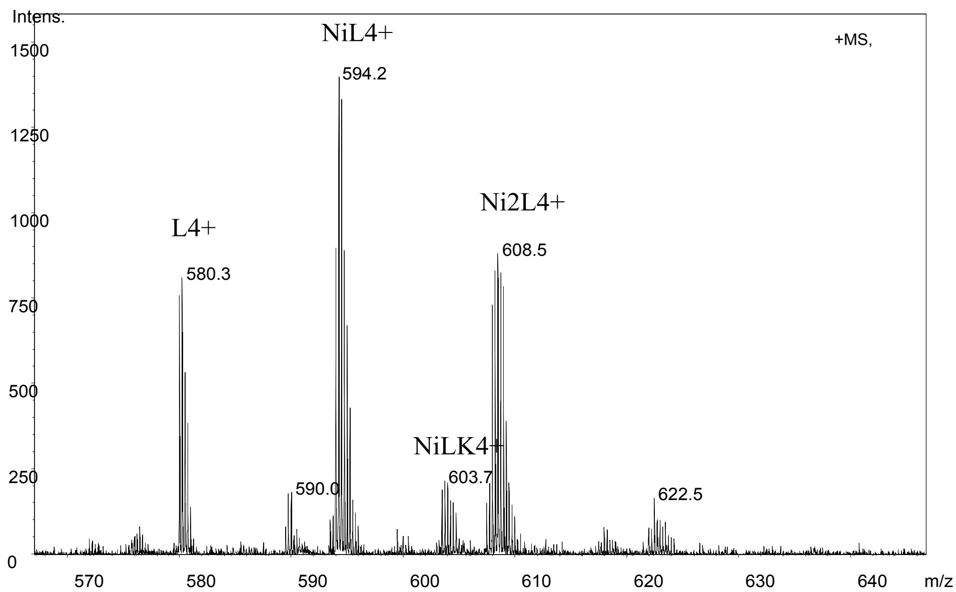
B)


Intens.
x10^4
-MS,
999.4 L+
LNa+
1021.4
1057.3 NiL+
NiLNa+
1079.3
NiLNaCl+
1115.3
NiLK3+
1175.2
m/z

C)


Intens.
+MS,
L3+
773.3
LK3+
786.0
ZnL3+
794.3
798.6
ZnLK3+
806.9
ZnLCl3+
819.6
m/z

D)


Intens.
+MS,
NiL4+
594.2
L4+
580.3
Ni2L4+
608.5
NiLK4+
603.7
590.0
622.5
m/z

E)

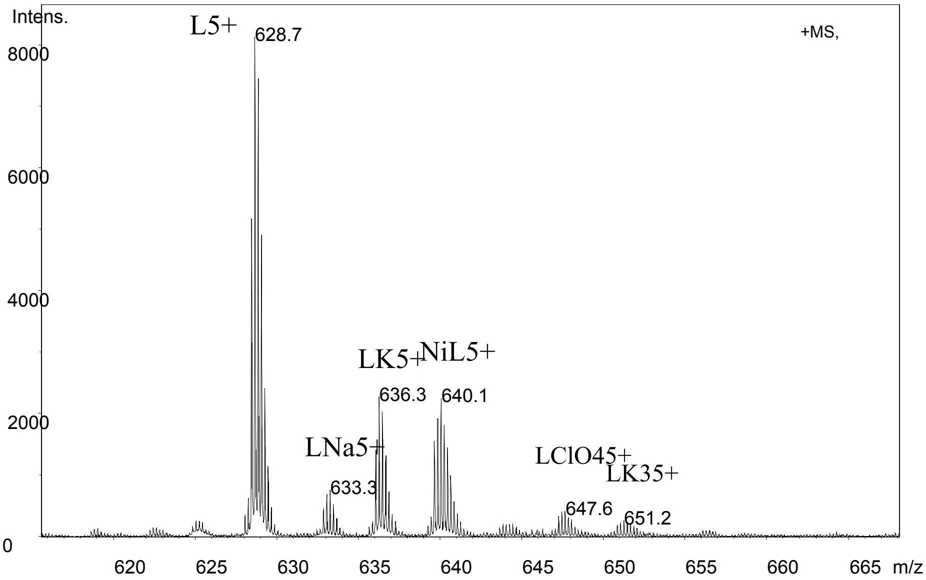
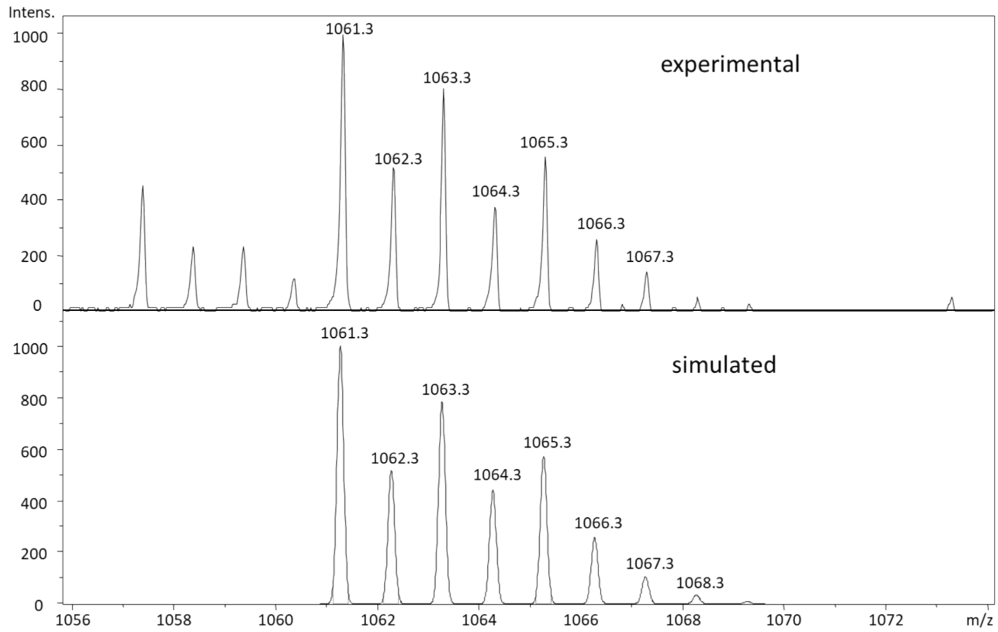
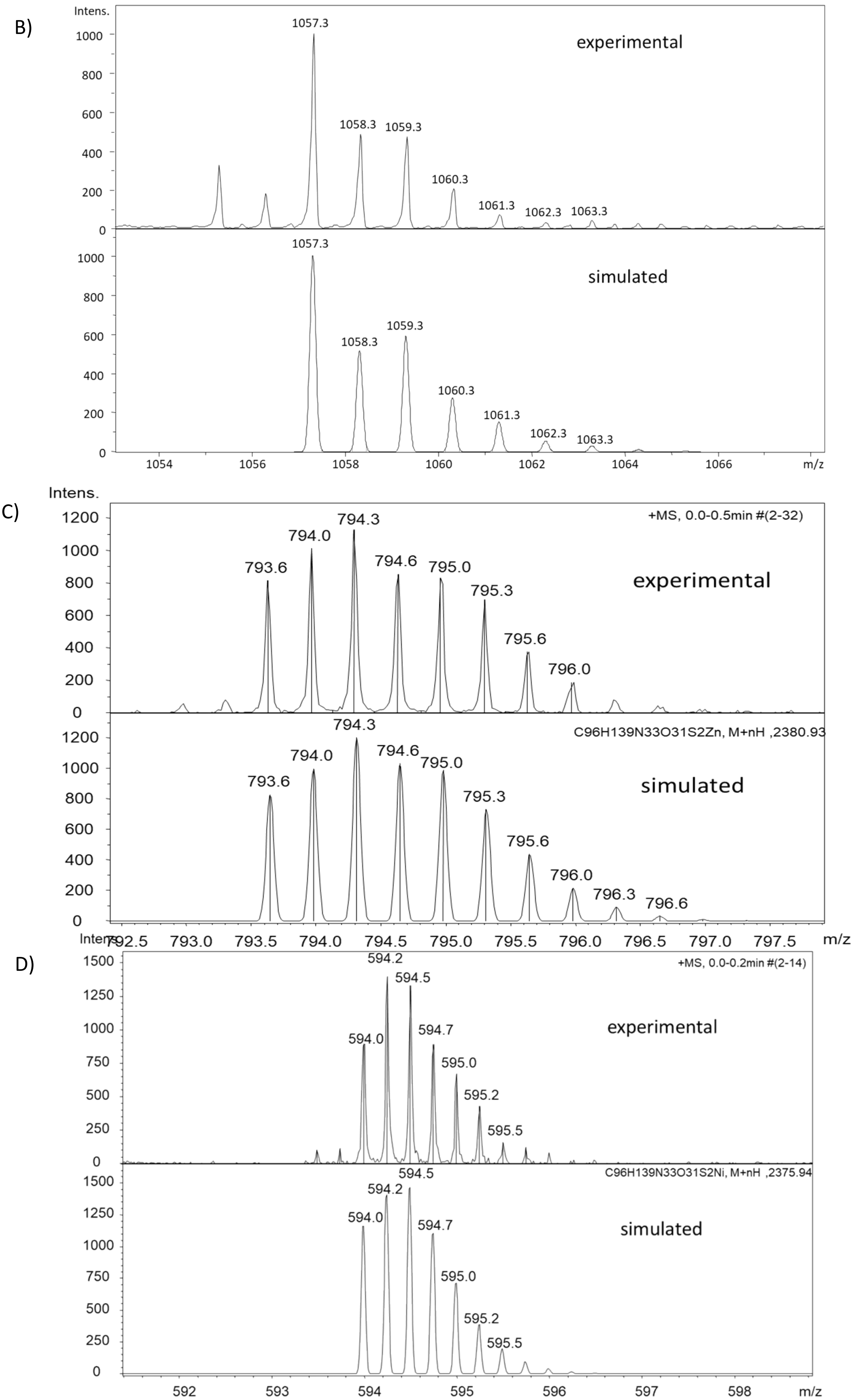


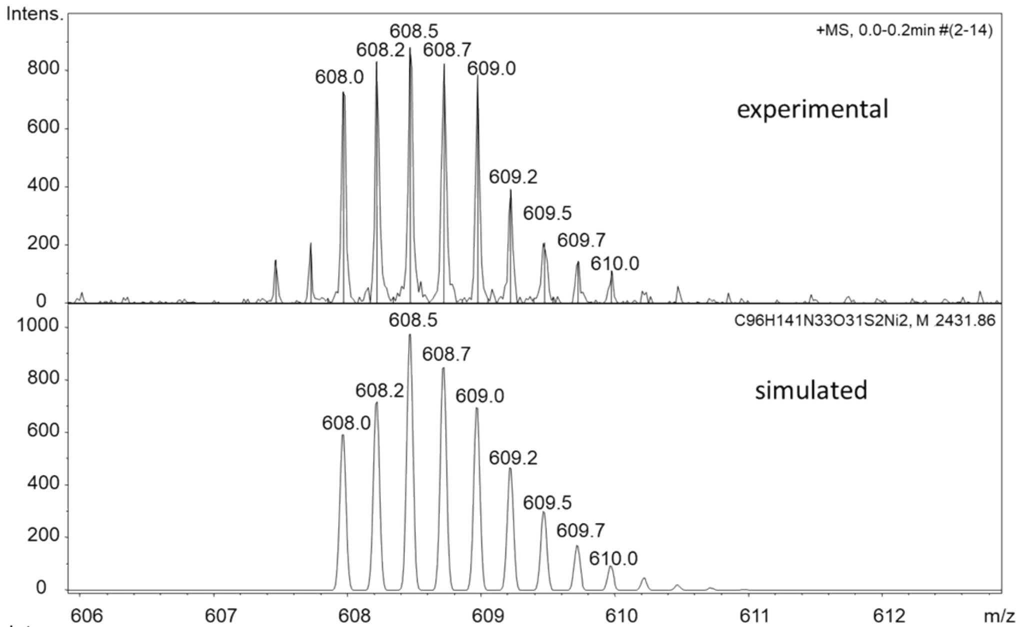
Figure S2. ESI-MS spectra of: A) Zn(II)-Ac-TDCHFHNS-NH_2, B) Ni(II)-Ac-TDCHFHNS-NH_2; C) Zn(II)-Ac-KCHFHAGVEHCVDDNNHDA-NH_2; D) Ni(II)-Ac-KKCHFHAGVEHCVDDNNHDA-NH_2; E) Ni(II)-Ac-SHQHTDSNPSATTDANSHCHTHADGEVHC-COOH. M(II)/L molar ratio = 1:1, pH 6.

A)




B)
Intens.
experimental
1057.3
1058.3
1059.3
1060.3
1061.3
1062.3
1063.3
simulated
1057.3
1058.3
1059.3
1060.3
1061.3
1062.3
1063.3
1054
1056
1058
1060
1062
1064
1066
m/z
C)
Intens.
+MS, 0.0-0.5min #(2-32)
experimental
793.6
794.0
794.3
794.6
795.0
795.3
795.6
796.0
C96H139N33O31S2Zn, M+nH ,2380.93
simulated
793.6
794.0
794.3
794.6
795.0
795.3
795.6
796.0
796.3
796.6
792.5
793.0
793.5
794.0
794.5
795.0
795.5
796.0
796.5
797.0
797.5
m/z
D)
Intens.
+MS, 0.0-0.2min #(2-14)
experimental
594.0
594.2
594.5
594.7
595.0
595.2
595.5
C96H139N33O31S2Ni, M+nH ,2375.94
simulated
594.0
594.2
594.5
594.7
595.0
595.2
595.5
592
593
594
595
596
597
598
m/z

E)



F)

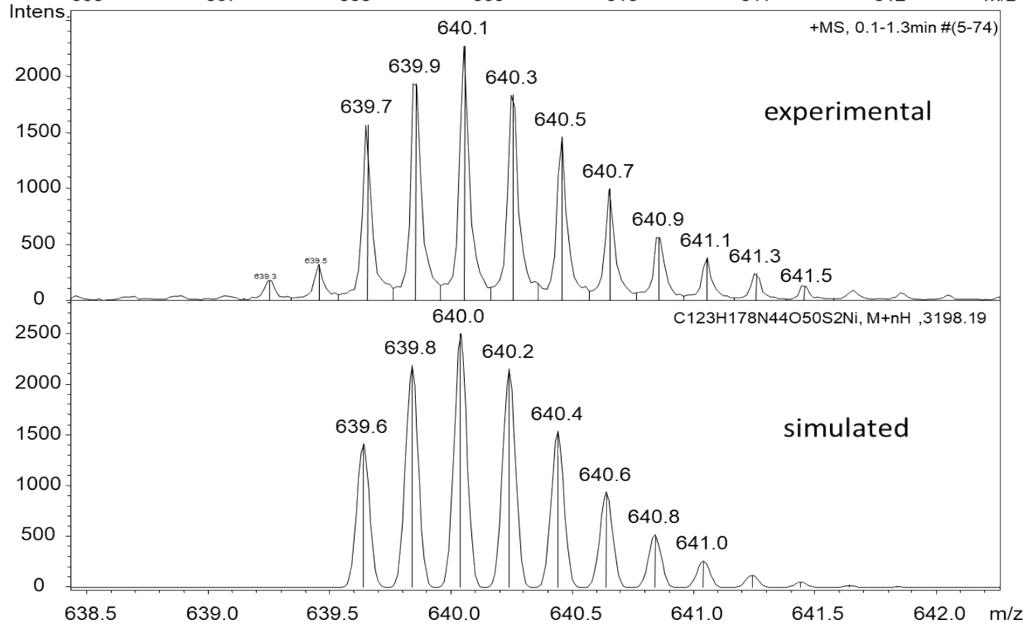
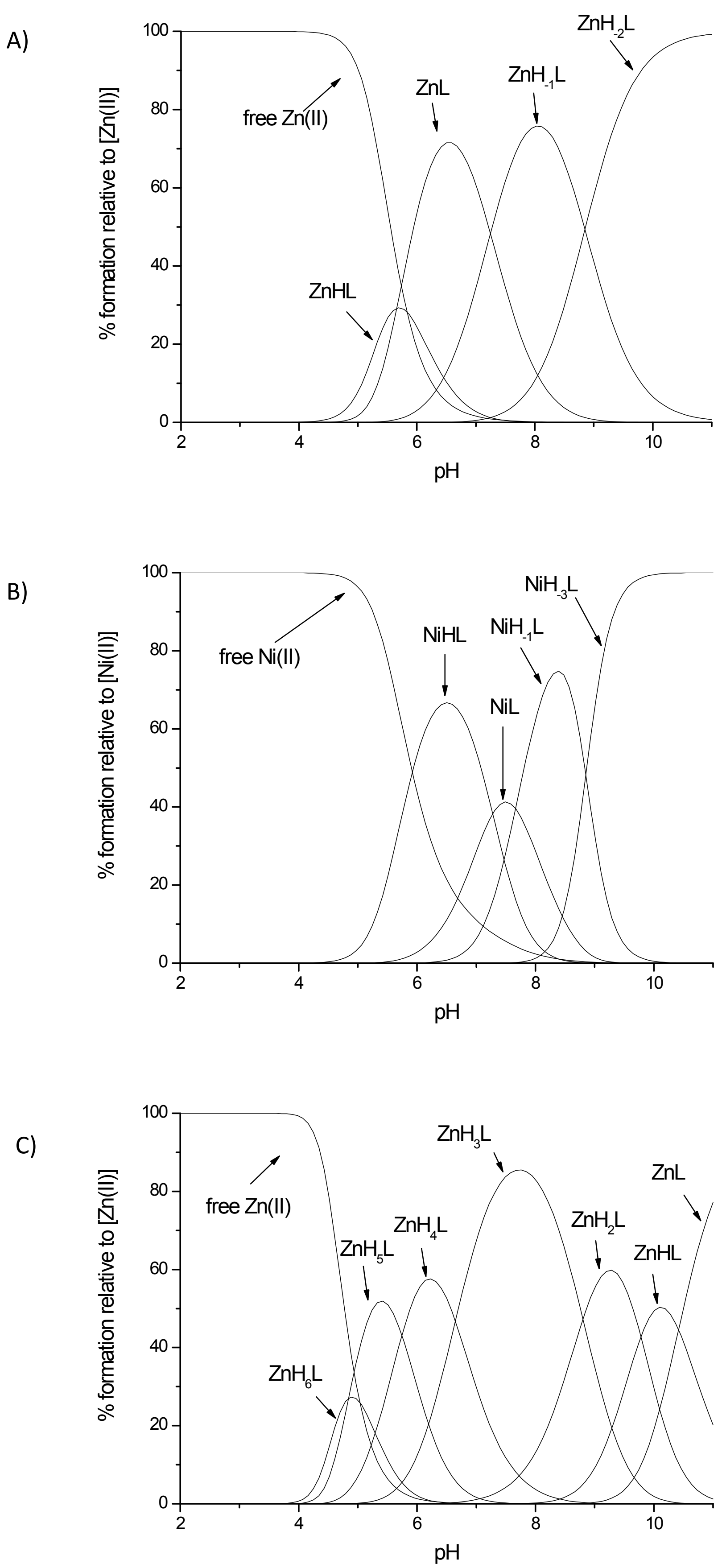
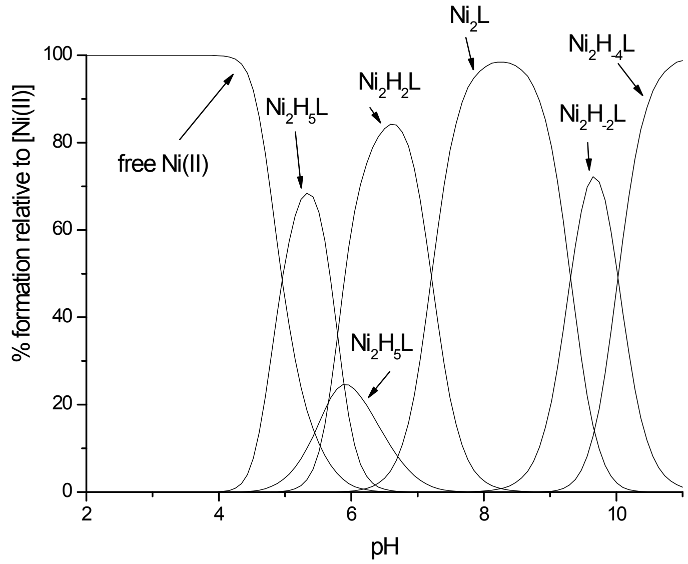


Figure S3. Isotopic distribution of: A) Zn(II)-Ac-TDCHFHNS-NH_2; B) Ni(II)-Ac-TDCHFHNS-NH_2; C) Zn(II)-Ac-KKCHFHAGVEHCVDDNNHDA-NH_2; D) Ni(II)-Ac-KKCHFHAGVEHCVDDNNHDA-NH_2; E) Ni_2(II)-Ac-KKCHFHAGVEHCVDDNNHDA-NH_2; F) Ni(II)-Ac-SHQHTDSNPSATTDANSHCHTHADGEVHC-COOH. M(II)/L molar ratio = 1:1, pH 6.


A)
% formation relative to [Zn(II)]
pH
free Zn(II)
ZnHL
ZnL
ZnH-1L
ZnH-2L
B)
% formation relative to [Ni(II)]
pH
free Ni(II)
NiHL
NiL
NiH-1L
NiH-3L
C)
% formation relative to [Zn(II)]
pH
free Zn(II)
ZnH6L
ZnH5L
ZnH4L
ZnH3L
ZnH2L
ZnHL
ZnL

D)



E)

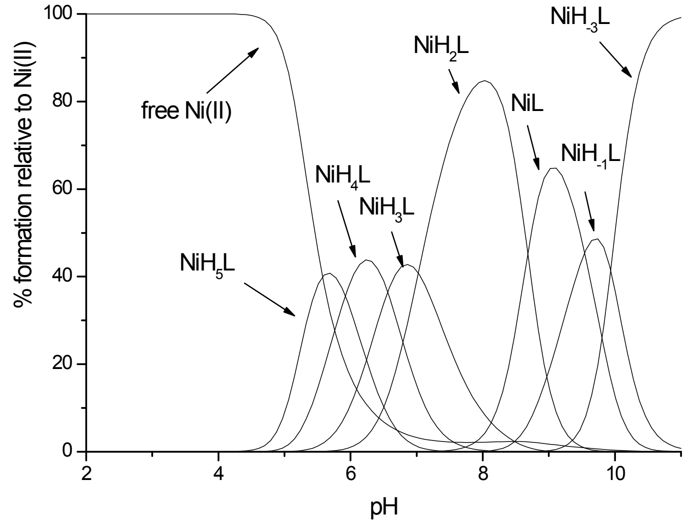


Figure S4. Distribution diagrams for the formation of: A) Zn(II) complex with the Ac-TDCHFHNS-NH_2 Zrt1 fragment:; B) Ni(II) complex with the Ac-TDCHFHNS-NH_2 Zrt1 fragment; C) Zn(II) complex with the Ac-KKCHFHAGVEHCVDDNNHDA-NH_2 Zrt1 fragment; D) Ni(II) complex with the Ac-KKCHFHAGVEHCVDDNNHDA-NH_2 Zrt1 fragment; E) Ni(II) complex with the Ac-SHQHTDSNPSATTDANSHCHTHADGEVHC-COOH Pra1 fragment; 298 K, I = 0.1 M, [M(II)]=$1 \bullet 10^{-3}$M; M(II)/L molar ratio = 1:1.

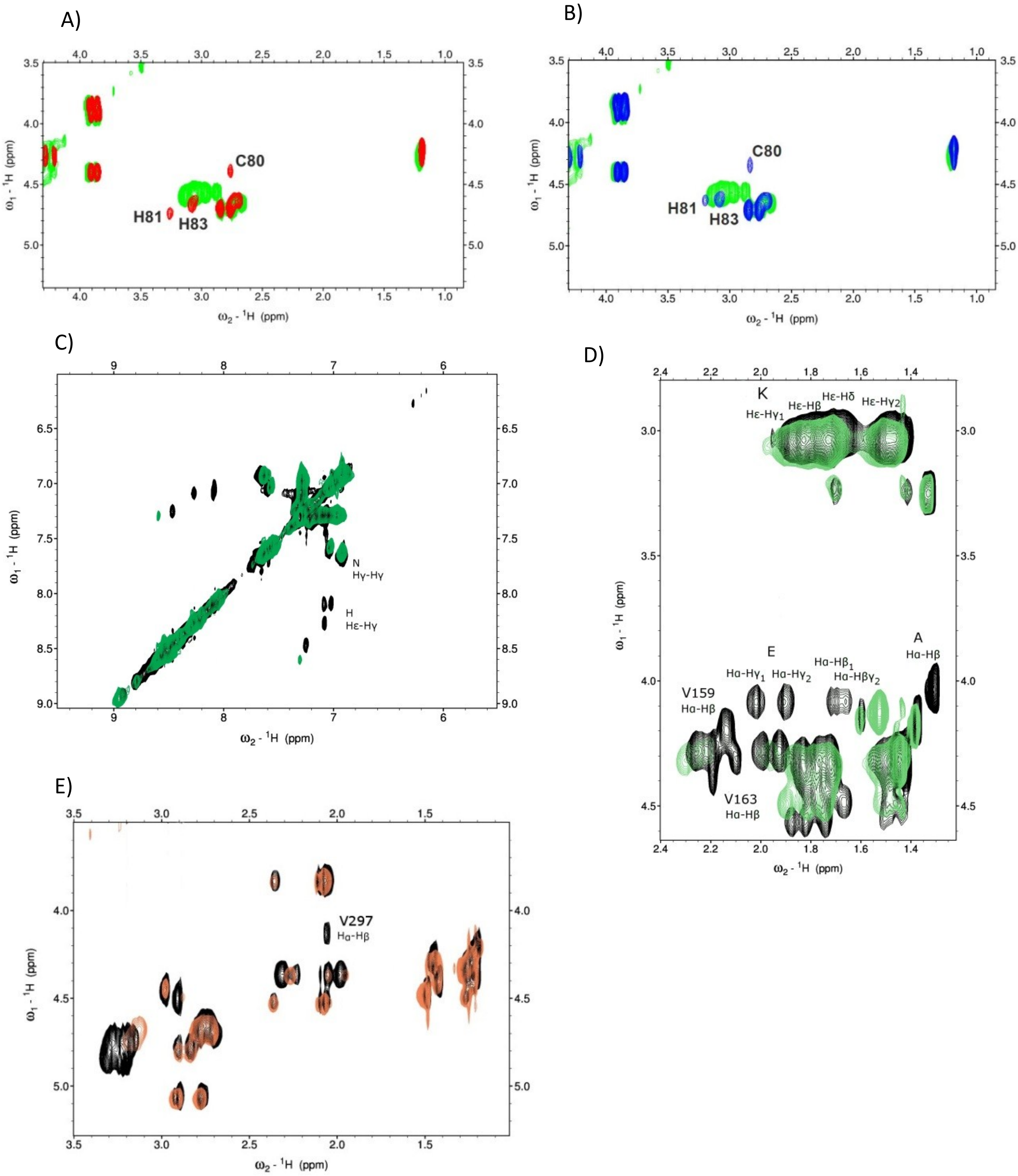


Figure S5. TOCSY spectra of 3 mM: A) Ac-TDCHFHNS-NH_2, in the absence (light green contours) and in presence (red contours) of 1 Zn(II) equivalent, pH 7.2; B) Ac-TDCHFHNS-NH_2, in the absence (light green contours) and in presence (blue contours) of 0.3 Ni(II) equivalent, pH 7.2; C) Ac-KKCHFHAGVEHCVDDNNHDA-NH_2, in the absence (black contours) and in presence (green contours) of 1 Zn(II) equivalent, pH 6.2; D) Ac-KKCHFHAGVEHCVDDNNHDA-NH_2, in the absence (black contours) and in presence (green contours) of 1 Zn(II) equivalent, pH 6.2 E)Ac-SHQHTDSNPSATTDANSHCHTHADGEVHC-COOH, in the absence (black contours) and in the presence(red contours) of 0.3 Ni(II) equivalent, pH 9. T = 298 K.

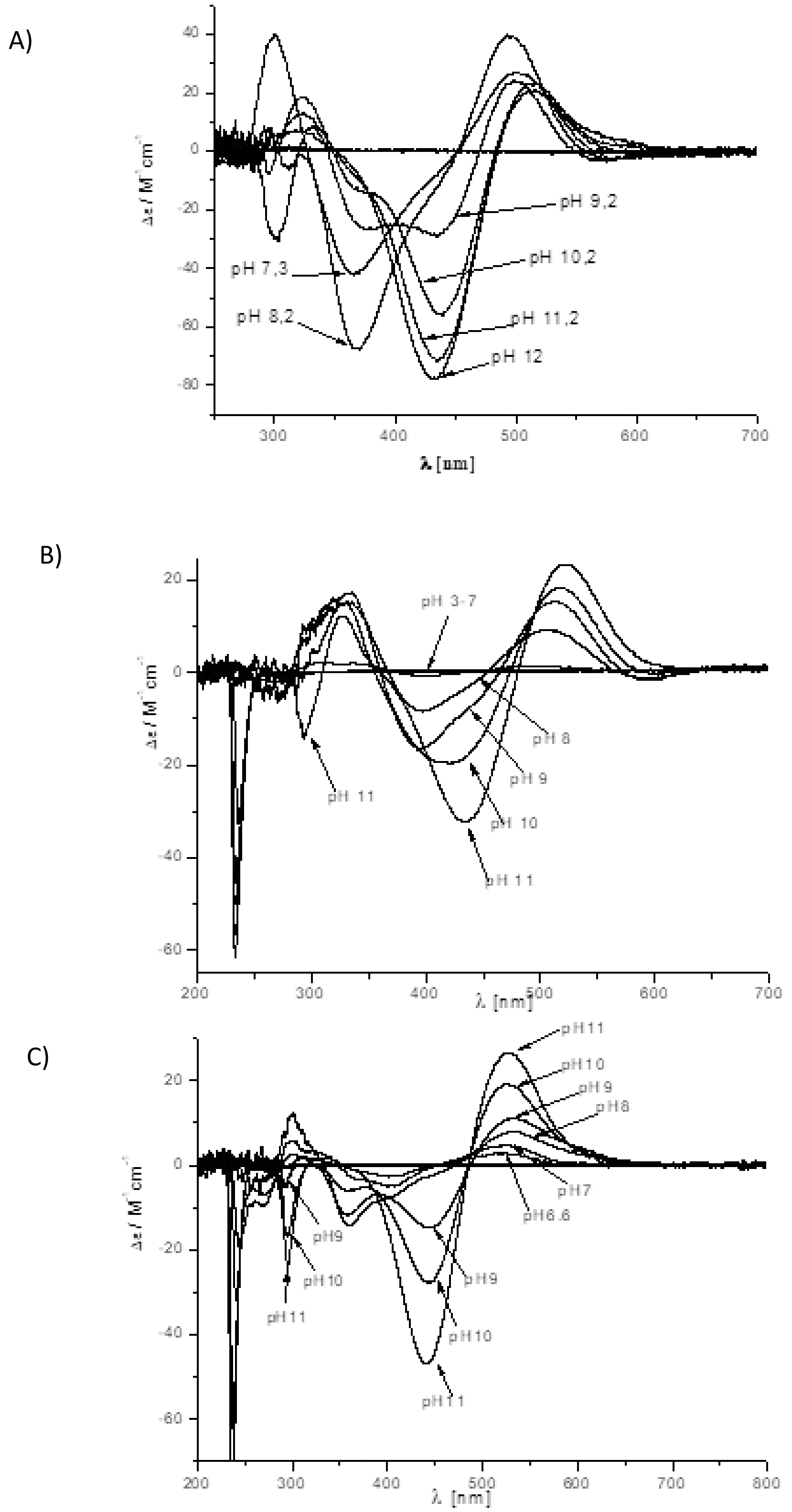


Figure S6. CD spectra of nickel(II) complexes with: A) Ac-TDCHFHNS-NH_2;; B) Ac-KKCHFHAGVEHCVDDNNHDA-NH_2; C) Ac-SHQHTDSNPSATTDANSHCHTHADGEVHC-COOH; in pH range 3-11.

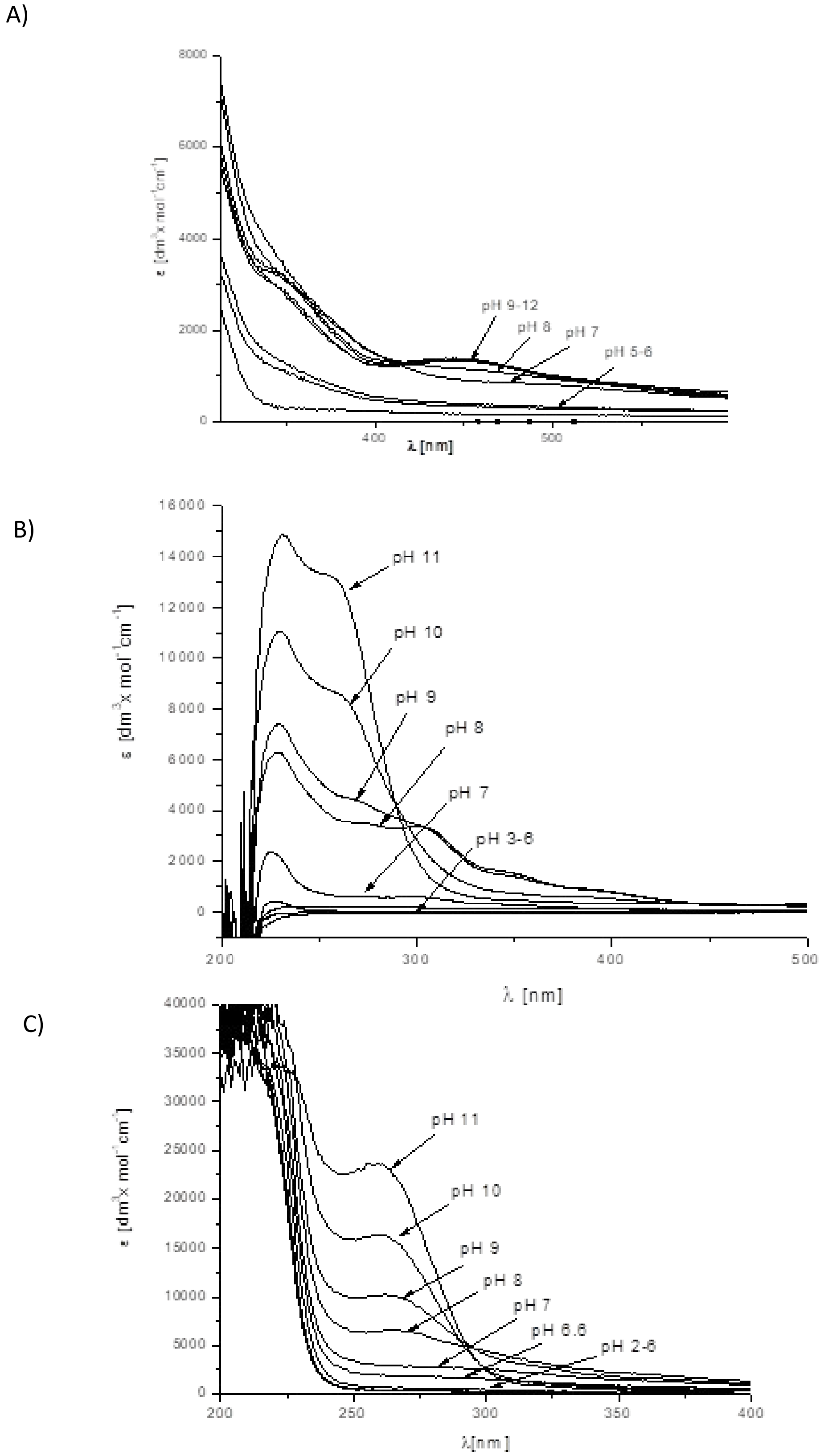


Figure S7. A) UV-Vis spectra of Ni(II) complexes with Ac-TDCHFHNS-NH_2 in the range 300-600 nm; B) Difference UV-Vis spectra of Ac-KKCHFHAGVEHCVDDNNHDA-NH_2 and Ni(II) in the range 200-500 nm C) Difference UV-Vis spectra of Ac-SHQHTDSNPSATTDANSHCHTHADGEVHC-COOH and Ni(II) in the range 200-400 nm.

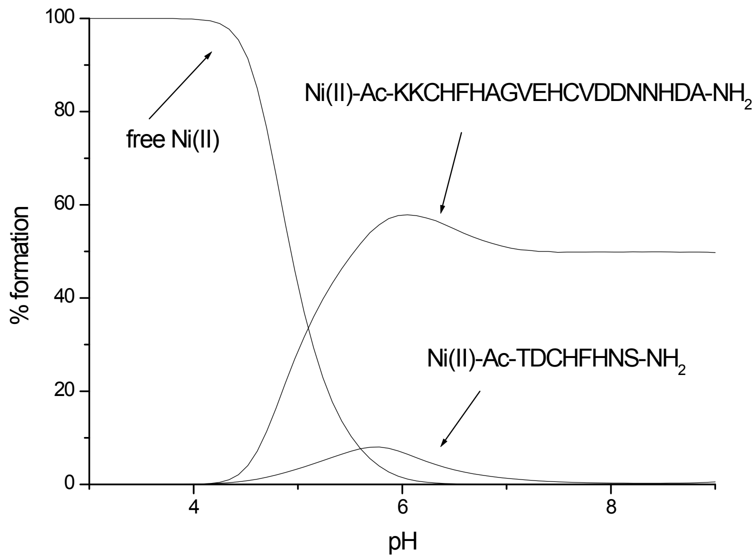


Figure S8. Competition plot between Zrt1 fragments: Ac-KKCHFHAGVEHCVDDNNHDA-NH_2, Ac-TDCHFHNS-NH_2 and Ni(II), describes complex formation at different pH values in a hypothetical situation, in which equimolar amounts of the three reagents are mixed. Calculations are based on binding constants from Table 1. Conditions: 298 K, I=0.1M, [Ni(II)] = [Ac-KKCHFHAGVEHCVDDNNHDA-NH_2] = [Ac-TDCHFHNS-NH_2] = 0.001 M.

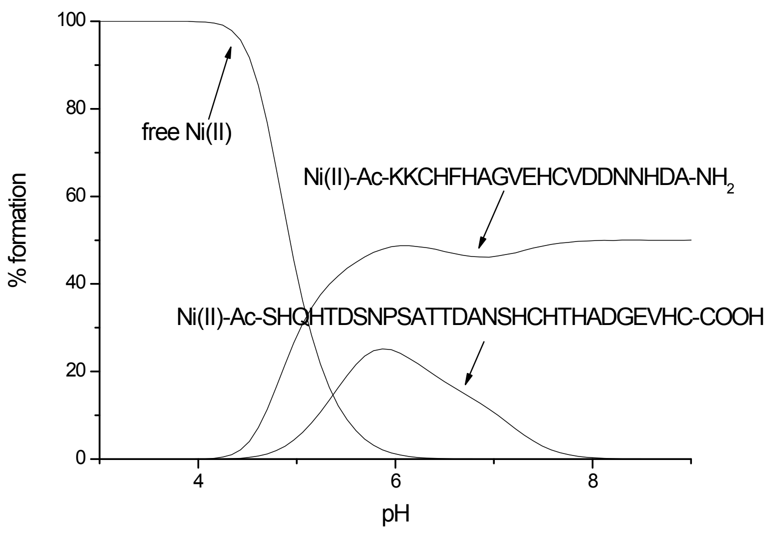


Figure S9. Competition plot between Pra1 and Zrt1 fragments: Ac-SHQHTDSNPSATTDANSHCHTHADGEVHC-COOH and Ac-KKCHFHAGVEHCVDDNNHDA-NH_2 and Ni(II), describes complex formation at different pH values in a hypothetical situation in which equimolar amounts of the three reagents are mixed. Calculations are based on binding constants from Table 1. Conditions: 298 K, I=0.1M, [Ni(II)] = [Ac-SHQHTDSNPSATTDANSHCHTHADGEVHC-COOH] = [Ac-KKCHFHAGVEHCVDDNNHDA –NH_2] = 0.001 M.