**Fig. S1** – Potentiometric titration curves of aqueous solutions containing EDDA, alone (●) with $C_L = 3.91 \times 10^{-3}$ M, and in presence of the three-charged metal ions (M$^{3+}$), at conditions of: ca. 1:1 ligand-to-metal molar ratio and $C_{Fe} = 3.91 \times 10^{-3}$ M (●), $C_{Ga} = 3.91 \times 10^{-3}$ M (▲) and $C_{Al} = 3.84 \times 10^{-3}$ M (×); ca. 1:0.5 ligand-to-metal molar ratio and $C_{Fe} = 1.96 \times 10^{-3}$ M (○) and $C_{Ga} = 1.92 \times 10^{-3}$ M (△). $I = 0.2$ M KCl, $T = 25.0$ °C.

**Fig. S2** – Absorption spectra registered at different pH values and 1:1 ligand-to-metal molar ratio for the EDTAPr(3,4-HP)$_2$/Fe(III) system with experimental (–) and calculated (×) absorption spectra for the EDTAPr(3,4-HP)$_2$/Fe(III) system, for pH from 0.8 and 2, with $C_L = 2.75 \times 10^{-4}$ M, $C_{Fe^{3+}} = 2.71 \times 10^{-4}$ M. $I = 0.2$ M (KCl, HCl), $T = 25.0$ °C.
Fig. S3 – Graphical representation of the chemical shifts as a function of pD of the spectra obtained for the ligand EDTAPr(3,4-HP)$_2$ alone (▲) and for the EDTAPr(3,4-HP)$_2$/Al(III) system (▲) at a) 1:1 and b) 3:1 ligand-to-metal molar ratio.

Fig. S4 – Potentiometric titration curves of aqueous solutions containing EDTAPr(3,4-HP)$_2$, alone (▲), and in presence of the Zn$^{2+}$ metal ion, at: 1:0.5 (▲), 1:1 (▲) and 1:2 (○) ligand-to-metal molar ratio, $C_L = 3.09 \times 10^{-3}$ M. $l = 0.2$ M KCl, $T = 25.0 \degree C$. 
Fig. S5 – Detailed and comparative representation of the $^1$H NMR spectra of the ligand EDTAPr(3,4-HP)$_2$ free and in the presence of Zn(II), at 1:1 and 1:2 ligand-to-metal, and at the indicated pD.