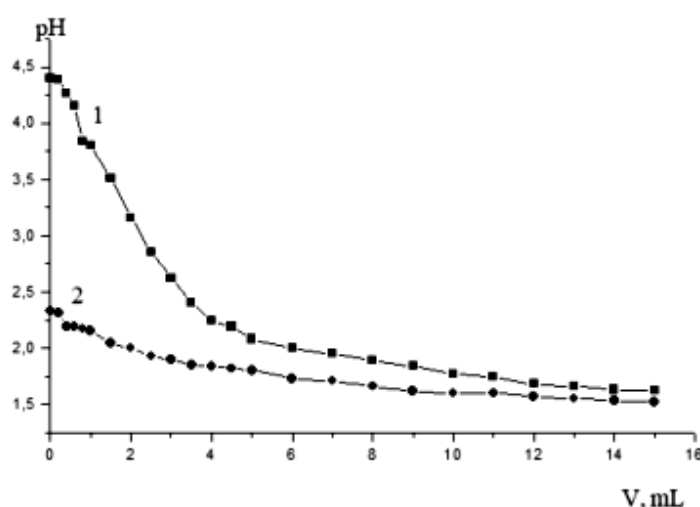


PVP-Fe³⁺ complex the dependence of a specific conductivity on a ratio of initial components of systems was investigated (Fig. 2). Increase of an electrical conductivity is caused by the allocated H⁺ ions during reaction between PVP with iron ions. The conducted conductometric studies indicate that a complexing process is followed by increase in an electrical conductivity of systems. In the course of complexing of a polymeric ligand PVP there is a decrease of its hydrodynamic sizes (chelate effect), allocation of protons that is confirmed by results of an experiment. According to the literary [17] and experimental data, it is possible to assume that in the studied PVP-Fe³⁺ system the complexes of composition [PVP]:[Fe³⁺] = 4:1 are formed (Fig. 1, 2).

In the Figure 3 curves of potentiometric titration of PVP solution by an aqueous solution of the hydrochloric acid in the absence and presence of a metal ion at $T = 318\text{ K}$, $I = 0.1\text{ mol/L}$ are presented. It is necessary to notice that curves of potentiometric titration at other values of temperature (298, 333 K) and ionic strength of solution ($I = 0.50; 1.00$) have a similar appearance. Curves of titration in the presence of metal ions as it is visible from the Figure 3, are in more acidic area, than in their absence that can demonstrate existence of a complexing process between a polymeric ligand and a metal ion. According to literary data [18, 19], the more shift of titration curves of systems polymer-metal ion of rather pure polymer, is higher stability of the polymer-metal complexes which are formed.



1 — a curve of potentiometric titration in absence of a metal ion;
2 — a curve of potentiometric titration in the presence of a metal ion

Figure 3. Curves of potentiometric titration of aqueous solutions PVP-Fe³⁺ by hydrochloric acid (10^{-2}) at $T = 318\text{ K}$, $I = 0.1\text{ mol/L}$

The calculated values of Bjerrum's formation functions of a polymer-metal complex on the basis of PVP and iron (III) chloride are presented in Table 1. Apparently from Table 1, the complexing ion of metal and a polymeric ligand among themselves form four coordination bonds that is agreed with results of the experimental studies. With increasing of the hydrochloric acid the bond $\text{O}^- - \text{Me}^{3+}$ is weakened. It is explained by protonation process of the functional group of polymer as bond $\text{O}^- - \text{Me}^{3+}$ is weaker than $\text{O}^- - \text{H}^+$ one [20].

Table 1

The calculated values of Bjerrum's formation functions of the PVP- Fe³⁺ complex
($T = 333\text{ K}$, $I = 0.50\text{ mol/L}$)

pH	[LH ⁺] mol/L	[L] mol/L	[L _K] mol/L	pL	n
3.60	0.85×10^{-3}	0.76×10^{-4}	3.24×10^{-2}	4.12	3.74
3.37	3.38×10^{-3}	2.95×10^{-4}	2.96×10^{-2}	3.53	3.41
3.20	5.91×10^{-3}	5.01×10^{-4}	2.99×10^{-2}	3.30	3.45
3.06	8.74×10^{-3}	7.24×10^{-4}	2.38×10^{-2}	3.14	2.75
2.90	12.1×10^{-3}	10.2×10^{-4}	2.02×10^{-2}	2.99	2.33
2.70	15.1×10^{-3}	12.6×10^{-4}	1.69×10^{-2}	2.90	1.95