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Fig. 1. Distribution of the gold(III) chloride complexes (a) and the equilibrium forms of formic acid (b)
as a function of pH at temperature 50 oC and concentration of chloride ions *C*Cl- = 0.1 M. In calculations,
the equilibrium constants of [AuCl4]- hydrolysis from [8] and dissociation constant of formic acid from [18], were used.

Fig. 2. Absorption spectrum of the [AuCl4]- with the maximum at λ = 314 nm in the range of wavelength 200-400 nm. Experimental conditions: *C*0,Au(III) = 0.15 mM, pH = 2.9, temperature (50±0.1) oC.

Fig. 3. The decrease of intensity of [AuCl4]- absorption band (λ = 314 nm) and increase of plasmon absorption band (λ = 580 nm) during the reaction with HCOOH. Experimental conditions: *C*0,Au(III) = 0.15 mM; *C*0,HCOOH = 15 mM; pH = 2.9; temperature (50±0.1) oC.

Fig. 4. Dependence of *k*obs vs. *C*HCOOH for the reaction of [AuCl4]- with formic acid at pH = 2.9. The other experimental conditions: *C*0,Au(III) = 0.15 mM; temperature (50±0.1) oC; *I* = 0.05 M.

Fig. 5. Dependence of log (*V*0) vs. log (*C*0,Au(III)) for the parallel reactions of [AuCl4]- with the formic acid - the value of the slope indicates the order of reaction with respect to [AuCl4]-.

Fig. 6. Dependence of ln(*k*obs) vs. ln(*C*0,HCOOH) - the value of the slope indicates the order of reaction with respect to HCOOH.

Fig. 7. Brönsted–Bjerrum dependence [20] for the reaction of [AuCl4]- with HCOOH. Experimental conditions: pH = 2.9, temperature (50±0.1) oC; *C*0,Au(III) = 0.15 mM; *C*0,HCOOH = 1.5 mM.

Fig. 8. The Eyring dependence for the reaction of [AuCl4]- with HCOOH. Experimental conditions: *C*0,Au(III) = 0.15 mM; *C*0,HCOOH = 1.5 mM; pH = 2.9; *I* = 0.05 M.

Fig. 9. The pictures of solutions after 48 hours from the mixing of 0.15 mM HAuCl4 with 150 mM HCOOH at different pH conditions: a) pH = 1 – the lack of gold precipitate; b) pH = 2.5 – gold precipitate; c) pH = 2.9 – gold precipitate; d) pH = 4.0 – gold as a colloid; temperature 50 oC.

Fig. 10. An example of turbidimetric curves registered at λ = 580 nm during the gold particles formation in the reaction of [AuCl4]- with CHOOH: a) pH = 2.9; b) pH = 4.0. Experimental conditions: *C*0,Au(III) = 1.5 mM, *C*0,CHOOH = 150 mM, temperature (50±0.1) oC.

Fig. 11. An example of kinetic curve, hydrodynamic radius vs. time, registered using DLS method for the gold particles formation in the reaction of [AuCl4]- with HCOOH. Experimental conditions: *C*0,Au(III) = 1.5 mM, *C*0,CHOOH = 150 mM, temperature (50±0.1) oC.