SYNTHESIS AND STRUCTURE OF HETEROMETALLIC MULTILIGAND Ge(IV) - 3d-METALS COMPLEXES WITH 1-HYDROXYETHANE-1,1-DIPHOSPHONIC ACID AND 1,10-PHENANTHROLINE

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Abstract. Five new coordination compounds were isolated $[M(phen)_3]_4[Ge_6(\mu\text{-}OH)_4(\mu\text{-}O)_2(\mu\text{-}hedp)_6]\cdot xCH_3COOH\cdot nH_2O$ (M = Fe (**1**), x=0, n=20; Co (**2**), x=2, n=30; Ni (**3**), x=2, n=26), $[Cu(phen)_2(H_2O)]_2[Cu(phen)(H_2O)_3]_2[Ge_6(\mu\text{-}OH)_4(\mu\text{-}O)_2(\mu\text{-}hedp)_6]\cdot 16H_2O$ (**4**), $[Zn(phen)_2(H_2O)_2]_2[Zn(phen)(H_2O)_4]_2[Ge_6(\mu\text{-}OH)_4(\mu\text{-}O)_2(\mu\text{-}hedp)_6]\cdot 18H_2O$ (**5**), were H_4hedp – 1-hydroxyethane-1,1-diphosphonic acid, phen – 1,10-phenanthroline. The synthesis of thereof was developed. It was found that the complexes belong to the cation-anion type, consisting of the hexanuclear complex anion, in which Ge atoms are connected by three types of bridging ligands (hydroxy-, oxo-, and 1-hydroxyethane-1,1-diphosphonate), and phenanthroline-containing cations of different composition depending on the 3d-metal. Synthesized substances in crystals are organic-inorganic hybrid ensembles with three-dimensional networks formed by numerous intermolecular hydrogen bonds between complex cations, anions, and crystalline water molecules.

Keywords: 1-hydroxyethane-1,1-diphosphonic acid, nitrogen heterocycle, germanium, 3d-metal, crystal structure.