Specific Features of the Structure of Germanium(IV) Complexes with Polybasic Acids

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Abstract—The specific features revealed in the structure of germanium(IV) compounds with ligands in the form of anions of polybasic acids (monoamine, diamine, and triamine complexones, i.e., hydroxyethylidenediphosphonic and carboxylic acids) have been considered. The influence of the individuality of specific acids on the structure type (mononuclear, binuclear, trinuclear, hexanuclear, polynuclear), the coordination mode of monodentate ligands and donor atoms of polydentate ligands (terminal, bridging, chelating, chelating–bridging), and variants of the coordination of polydentate ligands, i.e., anions of polybasic acids, with metal atoms (germanium, rare-earth elements, copper, barium), as well as on the dependence of the Ge–O bond length on the individual nature of ligands (OH, H₂O, O(oxo)) and donor atoms of polydentate ligands α- and β-O(carb), O(hyd), O(P)] and their function in the structure (terminal, bridging, chelating, chelating–bridging), has been analyzed using 28 homometallic and heterometallic complexes as an example.

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1. INTRODUCTION

Over the last two decades, the coordination chemistry of germanium compounds with a wide spectrum of polybasic potentially polydentate chelating organic acids has been studied in sufficient detail (see [1] and references therein). The complex formation of Ge(IV) compounds (stable in aqueous solutions) with complexones, namely, aminopolyacrylic, hydroxyethylidenediphosphonic, and hydroxycarboxylic acids, has been investigated. The synthesized compounds have been characterized using IR spectroscopy and thermal analysis. The crystal and molecular structures of a number of compounds of the aforementioned classes have been characterized using the X-ray diffraction analysis.

In this review paper, we consider the specific features revealed in the structure of germanium(IV) complexes with polybasic acids.

The compounds considered in this review exhibit a wide variety of structure types, including homometallic, heterometallic, oligomeric (mononuclear, binuclear, trinuclear, hexanuclear), and polymeric one-dimensional chain structures.

The initial organic reagents, their abbreviations, and structural formulas are presented in Schemes 1 and 2.
Scheme 1. Polybasic acids.