

SELECTIVITY, SYNTHESIS, CRYSTAL STRUCTURE AND BIOLOGICAL ACTIVITY OF THE ANION-COORDINATION PHENANTHROLINIUM TARTRATOGERMANATE

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Abstract. Novel supramolecular cation-anionic coordination compound $(\text{HPhen})_4[(\mu\text{-O})\{\text{Ge}_2(\text{OH})(\mu\text{-Tart})_2\}_2]\cdot 9\text{H}_2\text{O}$ was synthesised and characterised by the X-Ray, elemental, IR- and Hirshfeld surface analysis. It was established that original synthesis method and ability of 1,10-phenanthroline to be protonated promotes the formation of $[(\mu\text{-O})\{\text{Ge}_2(\text{OH})(\mu\text{-Tart})_2\}_2]^{4-}$ anion. In this anion, dimeric fragments are connected by a bridging oxygen atom, and the coordination polyhedra around the germanium atoms adopt a distorted trigonal bipyramidal geometry. The cations HPhen^+ serve as effective building blocks, strengthening the overall structure through classical hydrogen bonding and additional $\pi\text{-}\pi$ stacking interactions. Biological screening of $(\text{HPhen})_4[(\mu\text{-O})\{\text{Ge}_2(\text{OH})(\mu\text{-Tart})_2\}_2]\cdot 9\text{H}_2\text{O}$ demonstrated its remarkable enzyme-effector and antimicrobial activity. The compounds' efficacy can be attributed to the synergistic effects of the independent cations and anions, as well as the ability of protonated 1,10-phenanthroline to inhibit metal ions in enzymes and form stacking interactions with specific protein components. These characteristics make such compounds highly effective and promising antibacterial agents that minimize the risk of developing bacterial resistance.

Keywords: supramolecular chemistry, germanium, coordination compound, structure, biological activity.