

THE ROLE OF HALOGEN BONDING IN THE SYNTHESIS AND DESIGN OF TAP COMPLEXES

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Abstract. Halogenated 1,3,5-triazapentadiene (TAP) complexes are important coordination compounds with diverse structures and tunable electronic properties. This review examines the role of halogen bonding in their synthesis, structural organization, and functional design. Key concepts, including the σ -hole model and directional C–X \cdots Lewis base interactions, are discussed. Synthetic routes such as ligand complexation, metal-templated condensation, and solvothermal methods are summarized. The cooperative effects of coordination, hydrogen, and halogen bonds in stabilizing molecular and supramolecular structures are highlighted. Studies of Mn, Fe, Co, Ni, Cu, Zn, and Pd complexes show that halogen bonding influences crystal packing and network formation. Computational analyses support the importance of these interactions. Applications in catalysis, crystal engineering, supramolecular chemistry, and functional materials are also reviewed. Overall, halogen bonding is a powerful tool for designing and controlling TAP-based metal complexes.

Keywords: halogen bonding; TAP complex; 1,3,5-triazapentadiene; noncovalent interaction; σ -hole.

Received: 4 June 2026/ Revised final: 26 June 2026/ Accepted: 27 June 2026
