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Pyrolysis Kinetics of Fe (III) Complex Derived from Schiff base of 5-amino-1,2,3,4-thiatriazole with-ortho methoxy benzaldehyde

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ABSTRACT

The Fe (III) complex derived from the Schiff base of 5-amino-1,2,3,4-thiatriazole with ortho-methoxy benzaldehyde demonstrates significant structural, functional, and kinetic properties. This study investigates its thermal decomposition behaviour, stability, and reaction kinetics using thermogravimetric (TGA). The Schiff base acts as a bidentate ligand, forming a stable coordination compound, enhanced by the unique electron-donating properties of the thiatriazole ring containing nitrogen and sulphur atoms. The kinetic analysis, employing Doyle's modified method and Freeman and Carroll's approach, revealed accurate activation energy (12 kcal/mol), emphasizing the robustness of statistical methods in correlating experimental data with theoretical models. The results provide insight into the thermal stability and degradation pathways of the complex under different conditions. The complex exhibits versatile applications, including catalysis, material science, and environmental remediation, alongside antimicrobial and antioxidant activities. Its potential extends to developing advanced materials like MOFs, thin films, and electrochemical devices, highlighting its utility across diverse scientific and industrial domains.

Keywords: Solid State kinetics, Thermogravimetric analysis, Schiff base, T.G. curve, Activation energy.