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Microwave-Assisted Organic Synthesis: A Sustainable Approach in Green Chemistry

Ketan Gharat¹, Komal Patil², Prachi Mokal³, Sajid F. Shaikh⁴, Yashwant C. Gaikawad⁵, Amod N. Thakkar⁶

Students P.G. Department of Chemistry, Veer Wajekar College Phunde, Uran^{1,2,3} Assistant Professor Department of Chemistry, Veer Wajekar College Phunde, Uran⁵ Department of Chemistry, Anjuman Islam Janjira Degree College of Science, Murud Janjira Raigad⁴ Principal, Veer Wajekar ASC College, Phunde, Uran⁶

Abstract: Microwave-assisted organic synthesis (MAOS) has emerged as a powerful and eco-friendly alternative to conventional heating methods in organic chemistry. This technique offers rapid and uniform heating, significantly reducing reaction times and energy consumption while enhancing reaction efficiency and selectivity. Traditional synthetic methods often require prolonged heating, complex apparatus, and excessive use of reagents and solvents, leading to increased costs and environmental concerns. In contrast, microwave irradiation enables higher yields, improved reaction rates, and cleaner processes, aligning well with the principles of green chemistry. Additionally, MAOS facilitates the development of novel synthetic pathways that are challenging or unfeasible under conventional conditions. This review highlights the diverse applications of microwave-assisted synthesis in organic reactions, solid-phase synthesis, green chemistry, and nanotechnology, along with a discussion of the fundamental mechanisms of microwave heating.

Keywords: Energy-efficient, Sustainable synthesis, Green chemistry, Microwave-assisted organic synthesis, Solvent-free reactions



