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A Study of Polymeric Acidic Catalyst for Eco-Friendly Polyhydroquinoline Synthesis

Duse Bhargav Sadashiv

Research Scholar, Department of Chemistry, Mansarovar Global University, Sehore M.P., India.

ABSTRACT

Polymeric acidic catalysts have emerged as efficient and environmentally friendly tools for the synthesis of polyhydroquinoline derivatives. Polyhydroquinolines are an important class of heterocyclic compounds widely used in medicinal chemistry due to their significant biological activities such as antimicrobial, antioxidant, and cardiovascular effects. Traditional methods for synthesizing these compounds often involve harsh reaction conditions, toxic solvents, and non-reusable catalysts, which can lead to environmental pollution and increased production costs. In contrast, polymeric acidic catalysts offer a green and sustainable alternative for conducting these chemical reactions. Polymeric acidic catalysts possess several advantages, including high catalytic activity, easy separation from the reaction mixture, and the ability to be reused multiple times without significant loss of efficiency. These catalysts typically contain acidic functional groups attached to polymeric frameworks, which provide active sites for promoting chemical reactions. During the synthesis of polyhydroquinoline derivatives, the polymeric acidic catalyst facilitates the multi-component reaction involving aldehydes, dimedone, ethyl acetoacetate, and ammonium acetate. This catalytic process improves reaction efficiency, reduces reaction time, and increases product yield under mild conditions. Furthermore, the eco-friendly nature of polymeric acidic catalysts aligns with the principles of green chemistry by minimizing waste generation, reducing the use of hazardous reagents, and improving overall sustainability. The use of recyclable catalysts also lowers the environmental impact of chemical synthesis. Therefore, polymeric acidic catalysts represent a promising approach for the efficient and green synthesis of polyhydroquinoline compounds in pharmaceutical and chemical research.