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The Recent Progresses in the Catalytic Activity of Modified Chitosan Derivatives

Abstract:

Chitosan is a versatile polymer with a wide range of applications due to its unique properties such as biodegradability, non-toxicity, and high adsorption capacity. However, its high molecular weight and viscous nature limit its use. To overcome these limitations, various chemical modifications have been made to chitosan to improve its solubility, absorbability, and catalytic activity.

The modifications involve grafting desired groups to the amino or hydroxyl groups. Hence, the presence of abundant hydroxyl and amino groups in the polymer network makes it an effective catalyst alone or as a support for different heterogeneous catalytic systems or adsorbents for metal ions. In fact, the microporosity resulting from chitosan modification also enhances its catalytic activity. In this context, magnetic chitosan materials, for example, combine the properties of chitosan and magnetic particles, demonstrating easy separation and recovery, strong adsorption capacity, and high mechanical strength.

Several chitosan-based catalysts have been developed for various applications. For instance, the supramolecular CS-TDI-SSA-Fe₃O₄ nanocomposite acts as a heterogeneous organocatalyst to promote the three-component synthesis of 2,3-dihydroquinazoline-4(1H)-one under green conditions. The bio-based CS-EDTA-THEIC network contains appropriate basic and acidic active sites to act as a multifunctional reaction catalyst for the synthesis of pyrrole derivatives. In this lecture, different catalytic systems based on renewable and bio-degradable chitosan developed in our research group would be discussed

Biography

Mohammad G. Dekamin was born in Nahavand, Iran, in 1972. He received a BSc degree in Chemistry from Shahid Chamran University, Ahvaz, Iran, in 1995, a MS degree in Organic Chemistry from Shahid Beheshti University, Tehran, Iran, in 1997, and a PhD degree in the same subject from Sharif University of Technology (SUT), Tehran, Iran, in 2002. He is currently Professor of Organic Chemistry at Iran University of Science and Technology, Tehran, Iran. His research interests involve green and environmentally-benign chemistry, heterogeneous catalysis and organocatalysis, nanotechnology and pharmaceuticals.