Turning Glycerol into Fuel Additives

Nihar Rajpara
Chemical Engineering Department, School of Energy Technology, Pandit Deendayal Energy University, Gandhinagar, Gujarat, India

Akshar Patel
Chemical Engineering Department, School of Energy Technology, Pandit Deendayal Energy University, Gandhinagar, Gujarat, India

Om Solanki
Chemical Engineering Department, School of Energy Technology, Pandit Deendayal Energy University, Gandhinagar, Gujarat, India

Deep Mistry
Chemical Engineering Department, School of Energy Technology, Pandit Deendayal Energy University, Gandhinagar, Gujarat, India

Ashish P. Unnarkat *
Chemical Engineering Department, School of Energy Technology, Pandit Deendayal Energy University, Gandhinagar, Gujarat, India

Abstract

Acetylation of glycerol signifies a promising route for the valorization of glycerol, a major by-product of biodiesel production, into value-added chemicals such as monoacetin, diacetin, and triacetin. These acetins are widely used as bio-additives, plasticizers, and solvents due to their favorable physicochemical properties. In this study, the acetylation reaction was carried out using acetic acid as the acetylating agent in the presence of various solid acid catalysts. The catalysts were synthesized via thermal decomposition and wet impregnation methods, and characterized using XRD, SEM, and FTIR to evaluate their structural, morphological, and chemical properties. The sulfonated catalysts exhibited enhanced Brønsted acidity, leading to higher conversion of glycerol and greater selectivity toward triacetin. Parametric studies were performed for change in time, temperature, catalyst loading and mole ratio.

Keywords

Glycerol acetylation, Sulfated metal oxides, Triacetin, Diacetin, Monoacetin.