Green biodiesel production: a review on feedstock, catalyst, monolithic reactor, and supercritical fluid technology

Abstract

The advancement of alternative energy is primarily catalyzed by the negative environmental impacts and energy depletion caused by the excessive usage of fossil fuels. Biodiesel has emerged as a promising substitute to petrodiesel because it is biodegradable, less toxic, and reduces greenhouse gas emission. Apart from that, biodiesel can be used as blending component or direct replacements for diesel fuel in automotive engines. A diverse range of methods have been reported for the conversion of renewable feedstocks (vegetable oil or animal fat) into biodiesel with transesterification being the most preferred method. Nevertheless, the cost of producing biodiesel is higher compared to fossil fuel, thus impeding its commercialization potentials. The limited source of reliable feedstock and the underdeveloped biodiesel production route have prevented the full-scale commercialization of biodiesel in many parts of the world. In a recent development, a new technology that incorporates monoliths as support matrices for enzyme immobilization in supercritical carbon dioxide (SC-CO2) for continuous biodiesel production has been proposed to solve the problem. The potential of SC-CO2 system to be applied in enzymatic reactors is not well documented and hence the purpose of this review is to highlight the previous studies conducted as well as the future direction of this technology.