Enzymatic Production of FAME Biodiesel with Soluble Lipases

Biodiesel is a viable alternative to fossil fuels, and biocatalysis is gaining interest as a greener process. We focus on converting oils to Fatty Acid Methyl Ester (FAME) using soluble lipases, which offer an advantage compared to immobilized enzymes by cost efficiency and ease of implementation. Firstly, we defined the range of interest for process parameters of a low catalyst loading system, intended for single use. Furthermore, we systematically studied the effect and interaction between these parameters. Based on experimental data, a model was developed to evaluate the optimal conditions within the defined operating space concerning: temperature, water content, initial methanol concentration and enzyme content. The identified optimum range was experimentally evaluated, and model findings were confirmed. Another barrier in lipase use in biodiesel production is the higher melting point (m.p.) of certain oils, which is not compatible with the temperature range where lipases are most active. To address this, we explored a novel production strategy that accommodates the enzymatic requirements with the chemical limits of the substrates. The m.p. of the methyl ester product is lower than that of the starting material. Thus, we have incorporated a varying amount of the product to lower the m.p. of the starting material. Our case study is the reaction of Palm Fatty Acid Distillate (PFAD) to FAME. Conversion rates have been measured with varying temperatures, water concentration, and initial methanol content. The results of this investigation will be presented and discussed in this poster.