Stage III
Optimization of the laboratory technology - part II

A3.1 Factors that influence the quality of biodiesel
A3.2 Experiments to optimize the laboratory technology
A3.3 Physical and chemical characterization of raw materials and finished products
A3.4 Dissemination Results

The work in this stage was focused on four directions: ► factors that influence the quality of biodiesel ►optimization of laboratory technology - biofuels production ►physico-chemical characterization of raw materials and finished products and ► dissemination of partial results

Biodiesel, defined as mono-alkyl esters of fatty acids derived from vegetable oils or animal fats, is gaining a continuous interest and importance within the light of recent developments, such as the rising oil prices and the implementation of financial incentives for its use. Due to the increasing interest for biodiesel and for its use at large scale, the quality assurance of biodiesel and its properties as fuel have become a primary concern for successful marketing of biodiesel and its market acceptance. Consequently, quality standards of biodiesel in various countries and regions worldwide have been established or are been developed. Because of the nature of raw materials, production process, and post-production parameters, various factors can influence the quality of biodiesel. Fuel quality problems are usually reflected in contaminants or other minor components of biodiesel. In general, the quality of biodiesel can be influenced by several factors: the quality of raw materials, production processes and materials used in this process, post-production parameters.

The optimization of laboratory technology for enzymatic biodiesel production was done for the methanolysis realized in batch process - reaction with stirring, where the magnetic stirring has been replaced with mechanical agitation to prevent the destruction of the immobilized enzyme. In order to optimize the laboratory technology several sets of experiments have been achieved for the methanolysis of sunflower oil using five different lipases at three different reaction temperatures. The lipases used were as follows: free lipase from *Candida rugosa* (CRL), lipase B from *Candida antarctica* immobilized on acrylic resin support (Novozym 435), free lipase from porcine pancreas (PPL), lipase from *Mucor miehei* immobilized on macroporous ion exchange resin (Lipozyme IM MM) and lipase AK from *Pseudomonas fluorescens* (AK) in free form. The methanolysis of sunflower oil in presence of tert-butanol was realized for each lipase at three different reaction temperatures: 40 °C, 50 °C and 60 °C. Reactions were monitored for 24 h, and samples from the reaction mixture were taken at regular intervals and were analyzed using gas chromatography.

In this project, the raw material used for enzymatic biodiesel production was the sunflower oil obtained locally. The alcohol used was methanol because of its accessibility and low price, and as reaction medium was used the organic solvent tert-butanol. In this stage the main physical-chemical characteristics of these raw materials and finished product were determined.

The partial results obtained were disseminated through:

• publication in ISI journals (two articles accepted for publication) and in other scientific journals (2 articles published)

• scientific papers presented at national and international conferences (6 communications)