ISOTHERMAL CALORIMETRY OF ENZYMATIC BIODIESEL REACTION

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Calorimetric investigations are very useful for real-time monitoring of reaction rate and heat. Various chemical and physical effects can be revealed and observed closely such as adsorption, mixing, evaporation, stirring and chemical reactions during a calorimetric experiment. For enzymatic reactions, kinetic constants for first-order Michealis Menten reactions can also be determined [2]. The technique does not require clear, homogenous samples or modification of substrate with UV-active or fluorescent groups as for spectroscopy [1].

This technique is therefore very suitable to bring forth new information about effects taking place when using lipases immobilized on an inert carrier for transesterification of a triglyceride and an alcohol as for biodiesel production. The biodiesel is produced by rapeseed oil and methanol as well as ethanol and a commercial biocatalyst Novozym 435 from Novozymes containing a *Candida Antarctica B* lipase immobilized on an acrylic resin. The reaction investigated is characterized by immiscible liquids (oil, methanol, glycerol and biodiesel) and enzymes imm. on an inert carrier during reaction, which allows several effects to take place that during normal reaction conditions can not be elucidated. These effects have been observed with isothermal calorimetry bringing forth new information about the reaction of enzymes catalyzing transesterification.

Enzymatic biodiesel production has until now not been investigated with isothermal microcalorimetry, but the results and potential of the technique used for investigations of complex and heterogeneous substrates are presented and discussed in the presentation.

Reference List

1 Bianconi,M.L. (2007) Calorimetry of enzyme-catalyzed reactions. Biophysical Chemistry, **126,** 59-64.

2 Todd,M.J. and Gomez,J. (2001) Enzyme Kinetics Determined Using Calorimetry: A General Assay for Enzyme Activity? Analytical Biochemistry, **296,** 179-187.