The use of DSC in the determination of the Vapor-Liquid Equilibrium data for fatty systems

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Vapor-liquid equilibrium data of mixtures involving fatty acids and ethyl esters are practically nonexistent in literature. The great importance of such data for the biodiesel industry is related to the quality of the biofuel. Generally, it quality can be influenced by several factors, such as presence of Free Fatty Acids (FFA). These, depending of concentration, inhibit phase separation of ethyl esters and glycerol, which compromises the quality standards of biodiesel. Therefore, the present work aims to determine VLE data for fatty mixtures of acids and esters by Differential Scanning Calorimetry (DSC). This is an accuracy experimental technique that uses a shorter operation time and small amount of sample.

Samples of 5 to 8 mg were used in the analysis, with a heating rate of 25 ºC.min^{-1} and a small ball (diameter of 1.0 mm) placed over the pinhole (diameter of 0.8 mm made in the lids with the aid of a system consisting of a fixation assembly, mandrel, and drills), in order to avoid the pre-vaporization of the sample, since it behaves as an exhaust valve, releasing the vapor phase in a controlled manner.

This study also will improve the thermodynamic modeling by determining the binary interaction parameters of models used to describe non-ideality of the liquid phase needed for the development of equipment for fuel production (biodiesel) and other food products (base of chocolate and vegetable oil), pharmaceuticals and cosmetics.

Experimental data were obtained for the following systems: ethyl myristate + myristic acid, lauric acid + ethyl palmitate and ethyl palmitate + oleic acid. The data were modelated using the NRTL and UNIQUAC Equations. Both models were able to describe the experimental data with low deviations (< 3.0 %).

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