PREDICTIVE STUDY OF THE QUALITY OF BIODIESELS INVOLVING ARTIFICIAL NEURAL NETWORK MODEL

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Introdução

Biodiesel is a renewable bio-fuel, usually based on methyl esters, being derived from vegetable oils or animal fats, has continuously gained interest worldwide, as an alternative fuel for diesel engines. The main difference between biodiesel and petrodiesel are that the former has a higher cloud point, centane number, density and viscosity; and has a lower volatility, gross colorific value and sulfer content. The biodegradability and nontoxic behavior make biodiesel as environmentally friendly.

In Brazil, the National Biodiesel Program, recently implemented, has officially resulted in the addition of the biodiesel/diesel oil at the rate of 5% since the beginning of 2010. As, the composition of fatty acids in vegetable oils result in the properties of biodiesel produced, such as viscosity, flash point, high heating values, density, Oxidative stability and cetane number etc, and the experimental measurement of these properties are costly and time consuming. Therefore, efforts have been made to find useful methods to estimate these physical properties of fatty acid methyl esters (FAME) from physical properties related to its chemical composition.

In this study, the Artificial Neural Networks model (ANN) was used to estimate and predict the above mentioned physical properties of biodiesel fuel. The performance of ANN technique was evaluated by R-value and Root-Mean square error method.

Resultados e Discussão

For this purpose, Inter-Lab (*interlaboratorial*) with the permission of the biodiesel samples for predicting the quality of biodiesel fuel, were utilized.

In the figure 1, a configuration of ANN model is depicted, and table 1 shows the evaluation of the model, by using Root-Mean Square Error (RMSE) and correlation co-efficient (R) values. We observed a bad predictive results in case of Iodine number and Specific gravity.
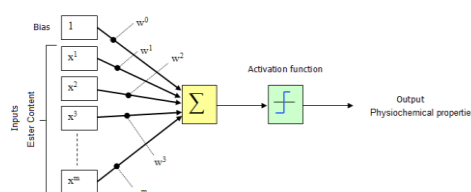

Figura 1. The figure representes the illustrations of configuration of neural network.

Tabela 1. Summary of the Artificial Neural Network Validation results

	R	RMSE
Specific Gravity	0.999	4.263
Kinametic Viscosity (40 C)	0.999	0.713
Acid number	0.999	0.380
Iodine number	0.644	6.937
Oxidative stability	0.978	2.238

Conclusões

An effective Neural network model of biodiesel fuel properties prediction based on ester content was built. The RMSE for the physical properties recommend this model for practical implementation.

Agradecimentos

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