Petrochemistry-2013

World Congress on
Petrochemistry and Chemical Engineering

November 18-20, 2013 Hilton San Antonio Airport, USA

Accelerated oxidation methods for determining the oxidative stability of biodiesel

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Abstract

The biodiesel is a renewable fuel, which basically consists of poly-unsaturated fatty acid alkyl esters (FAAS). Due to the nature of FAAS carbon chains, biodiesel may suffer oxidation reactions which directly modify its fuel properties (i.e. cetane number, acid value, kinematic viscosity, and others) and its storage lifetime. The standard EN 14214:2003 established by CEN, evaluates the oxidative stability of biodiesel by RANCIMAT® method. This method, involves the thermal-oxidation of FAAS at 110ºC, and requires 60 min to reach the temperature of analysis. Since 2009, we have been working in the development of new analytical methods to determine the oxidative stability of biodiesel, which pretend to be more simple, faster, cheaper and greener than conventional methods. The implementation of other sources of energy such us ultrasonics and UV radiation to accelerate the oxidation of FAAS, has become an effective alternative to determine the sample induction time in a much shorter period of time. We have recently developed a spectrometric method to determine the induction time by means of absorbance measurements at 270 nm in function of sonication time. Sonodegradation of FAAS was induced using an ultrasonic homogenizer fitted with an immersible horn at 480 Watts and 20 duty cycles. An induction time minimum limit of 65.5 min equivalent to 360 min by RANCIMAT® method was established in that work. Nowadays, we are working in the development of a new spectrometric method based on the FAAS photo-oxidation, which allows the assessment of the induction time in less than 15 min.

Biography

Francisco D. Avila Orozco, is a doctoral student in chemistry at INQUISUR-UNS-CONICET, who has been working on the biodiesel analytical studies and the development of analytical methods for the control of quality, since May 19, 2009, as subject of his doctoral thesis. He has been working under the direction of Dr. Beatriz S. Fernández Band, who works as full professor in the UNS chemistry department, and also as main researcher at CONICET.