

Towards a Reference Method for the Analysis of Triglycerides in Biodiesel using an On-line Hydrogenation Approach

Luis Ruano Miguel, Manuela Ulberth-Buchgraber, Andrea Held. European Commission,
Joint Research Centre, Institute for Reference Materials and Measurements (IRMM)
Geel, Belgium

With the introduction of the European Directives on renewable energies and on fuel quality, the demand to measure accurately the quality of biofuel products is increasing. Nowadays, many biodiesel methods used by field laboratories are strongly linked with regional standards, or analytes are method-dependent. Hence, a need to establish a metrological infrastructure, based on reference methods and materials as internationally recognised standards for the harmonisation of measurements to demonstrate the quality of biofuels worldwide, was identified [1]. In direct response, a reliable method with ensured traceability of the measurement results for triglycerides (TAGs) in biodiesel was developed, giving results beyond the state of the art of the current standard methods.

The analysis of TAGs in biodiesel is a very challenging task mainly due to three reasons: the large number of different TAGs typically present, the difficulty of separating those using chromatographic systems, and the low abundance of TAGs in biodiesel samples. The proposed method is based on an on-line hydrogenation using GC-FID. All TAGs are converted into their saturated analogues, resulting in structurally well defined analytes, simplified chromatograms and increased sensitivity of trace amounts of TAGs. After sample introduction the hydrogenation takes place on a fused silica pre-column coated with a palladium catalyst, using H₂ as carrier gas. This approach allows an immediate hydrogenation of vegetable oils and biodiesel, and has already been successfully applied for the quantification of TAGs in biodiesel samples from various feedstocks. Moreover, results show the potential of this method for the hydrogenation and quantification of di- and monoglycerides, too, which are like TAGs covered in EN 14214 [2], the basic document for defining product specifications and measurement methods for biodiesel in Europe.

[1] White Paper on internationally compatible biofuel standards, tripartite task force, Brazil, European Union and United States of America, December 2007

[2] EN 14214. Automotive fuels – Fatty acid methyl esters (FAME) for diesel engines – Requirements and test methods. (July 2003).