

Sulphur analysis in Biofuels, X -ray fluorescence approach in Europe

Charles-Philippe Lienemann, Lionel Burte, Estelle Roche, Laboratoire AAS-ICP-FX, Direction Physique et Analyse, IFP-Lyon, F-69390 Vernaison, tel: 33-(0)4.7802.2726, fax: 33-(0)4.7802.2745, email: charles.lienemann@ifp.fr

Violetta Uricanu, Huub Smit, EMEA Application Laboratory , PANalytical, Almelo, The Netherlands

There is now an overwhelming scientific consensus that global warming and climate change are happening. Many people now agree that climate change may be one of the threats for humanity. Intense researches are currently being made into reducing the emission of carbon dioxide. Road transport contributes up to 28% of the emission of carbon dioxide in Europe, this means that research on renewable fuels with a low contribution to carbon cycle becomes an interesting alternative.

The European community has decided to incorporate 5,75% of biofuels by 2010. Bioethanol and biodiesel can be produced from renewable resources like sunflower, colza, sugar beet, sugar cane, wine, corn and wheat.

Biofuels are established on the European market, some countries prefer bioethanol, and others biodiesel; 5% of fatty acid methyl ester (FAME) or ethanol has been allowed since 2005, rising to 10% in 2009. More projects are ongoing, not only at European level, but also at a national level to increase even more the percentage of renewable fuels in gasoline and diesel.

Just like others fuels, biofuels have to fullfil a certain number of specifications in order to be used as automotive fuels. These specifications include physical and chemical parameters that have to be met by the fuels. These parameters have to be controlled before the distribution of the fuels on the market and fully developed analytical methods are proposed for each parameter.

Sulfur in automotive fuels is traditionally measured by X-ray fluorescence. Both Energy Dispersive (EDXRF) and Wavelength Dispersive X-ray fluorescence (WDXRF) are validated for measuring S in European 2005 specifications for diesel and gasoline. If the biofuel content in the fuel is higher than 10%, oxygen content has to be taken into account when measuring sulphur.

With biofuels, the specification of sulphur has changed and the presence of oxygen could require a dedicated calibration curve with matrix matched approaches. The French and Swedish project of "flexfuel" cars is based on a fuel composed mainly of ethanol (65 to 80%). The different grades available during the year have an oxygen content varying between 23% and 30% due to seasonal change.

Oxygen effect in these fuels will be investigated by X-ray fluorescence. The study will show that oxygen content in biofuels has an important influence on the sulphur measurement. Different solutions to correcting for the oxygen effect will be proposed. These solutions are based on matrix matched calibration, correction with internal standard, use of the Compton Effect or use of commercially available software.