

The quality control of Biofuels with a Simultaneous ICP-OES for Trace Metal Determination

Praveen Sarojam PhD,
Global application Centre, Mumbai



Biodiesel is a renewable fuel which means, the feed stocks can be regenerated after use. Phosphorus if present in biodiesel, can damage the

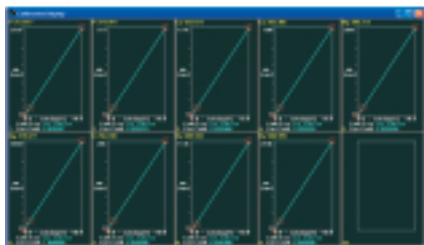
catalytic convertor system of vehicles. Ca, Mg, Na and K, all can cause injector clogging, piston and engine wear and also they will be responsible

for engine deposits. So it becomes extremely important to analyze these metal ions in biodiesel samples.

ASTM and CEN are two regulatory agencies which have published specifications for biodiesel (ASTM D 6751 & EN 14214). EN 14538 is the official method exclusive for the analysis of phosphorus in biodiesel and EN 14107 is for the analysis of Ca, Mg, Na & K. In the present work what we have done is, we have combined these two EN methods in to a single method for the simultaneous analysis of these metal ions in biodiesel. We have used the PE optima 7300 DV ICP-OES equipped with S-10 auto sampler and special accessories, for high throughput analysis. The dual view nature of the instrument helps to ensure extended linear dynamic range. The instrument is equipped with user friendly winlab version 4 software for ICP and the segmented array CCD detector helps to achieve simultaneous analysis of all the metal ions in a single run.

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The detection limits shows that the developed method is highly sensitive with respect to biodiesel analysis (See table)

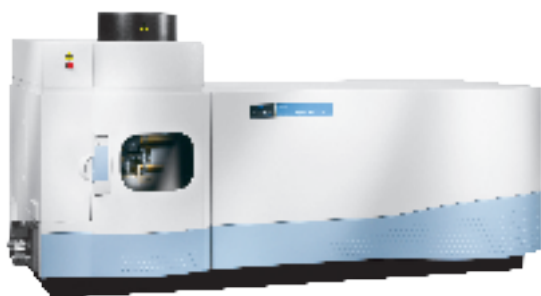


Calibration curves

Element	Wavelength (nm)	Instrument detection limits (mg/kg)	Biodiesel detection limits (mg/kg)
Phosphorus	213.620	0.04	0.4
Sodium	588.993	0.02	0.2
Potassium	766.485	0.08	0.8
Calcium	422.673	0.004	0.04
Magnesium	285.213	0.002	0.02

To conclude, a simultaneous, fast accurate method was developed for the analysis of trace metal impurities mentioned in ASTM and EN specifications. We have got excellent % RSD and the time required to complete one analysis of 5 metal ions with two different wavelengths and three replicates were 130 seconds. Out of this 130, 45 seconds were for wash in and wash out. We can reduce the analysis time further by using the flush option available with the winlab software. Additionally as both the wavelengths used gave identical results, one can go with the most sensitive line alone, which will further bring down the analysis time. In short the two different EN methods for the analysis of biodiesels with ICP-OES

were combined in to a single method. The analysis was carried out at the limits specified in the ASTM D 6751 and EN 14214 to ensure quality control of biodiesel samples obtained from different feedstocks. With the help of winlab version 4 software a fully automated analysis was achieved.



Optima 7300 DV ICP-OE



S10 Autosampler



Baffled cyclonic spray chamber and low flow gemcone nebulizer