

**Novel Aerosol Phase Extraction Method for the
Determination of Ca, K, Mg and Na in Biodiesel
Through Inductively Coupled Plasma Atomic
Emission Spectrometry**

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Table S1. Concentration values for the biodiesel certified reference material ($10.0 \pm 0.1 \text{ mg kg}^{-1}$) obtained for Ca, K, Mg and Na by applying both extraction procedures (Mean \pm s).

	Reference extraction procedure	Aerosol phase procedure
Ca	10.6 ± 0.3	10.02 ± 0.03
K	9.8 ± 0.3	10.021 ± 0.008
Mg	9.87 ± 0.12	9.995 ± 0.007
Na	9.9 ± 0.3	9.999 ± 0.019

Table S2. Statistical comparison of a measurement results on a certified reference material with the certified value.

	Ca	K	Mg	Na
Δm	0.02	0.02	0.005	0.0006
U_A	0.10	0.10	0.100	0.1008

Table S3. Relative standard uncertainty contributions and expanded relative uncertainty for measurement of Na, K, Ca and Mg in biodiesel samples.

	Ca	K	Mg	Na
u_{cal}	0.786 %	0.538 %	0.628 %	0.533 %
u_{ip}	0.032 %	0.006 %	0.011 %	0.064 %
u_{rep}	0.081 %	0.037 %	0.032 %	0.026 %
u_{t}	0.500 %	0.500 %	0.501 %	0.504 %
Expanded relative uncertainty ($U, k=2$)	1.871 %	1.470 %	1.607 %	1.473 %

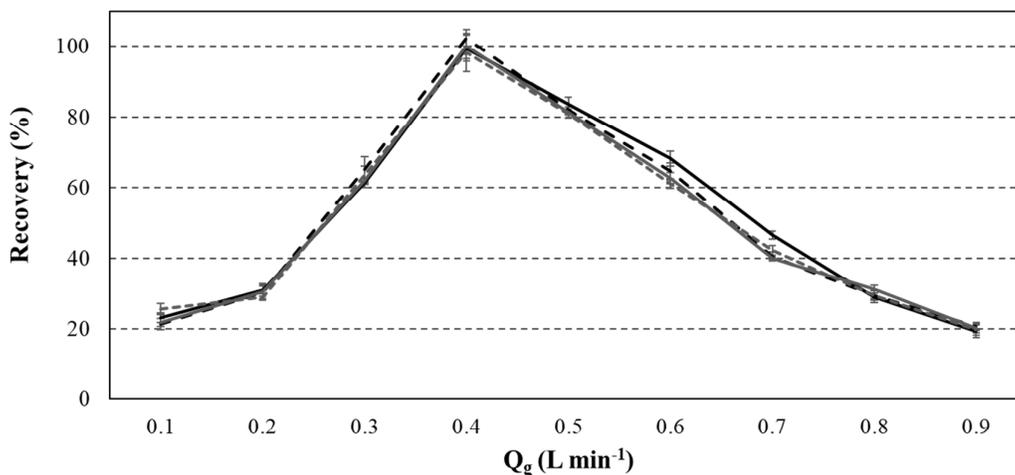


Figure S1. Effect of the gas flow rate on the recovery. $[\text{HNO}_3] = 0.1 \text{ mol L}^{-1}$; $r(\text{m}_{\text{Organic phase}}/\text{m}_{\text{Aqueous phase}}) = 0.5$; $Q_1 = 0.5 \text{ mL min}^{-1}$; Extraction time: 60 s; Nebulizer tip to organic phase gap = 1.5 cm. Black line: Ca; Dotted black line: K; Dotted grey line: Mg; and, Grey line: Na.

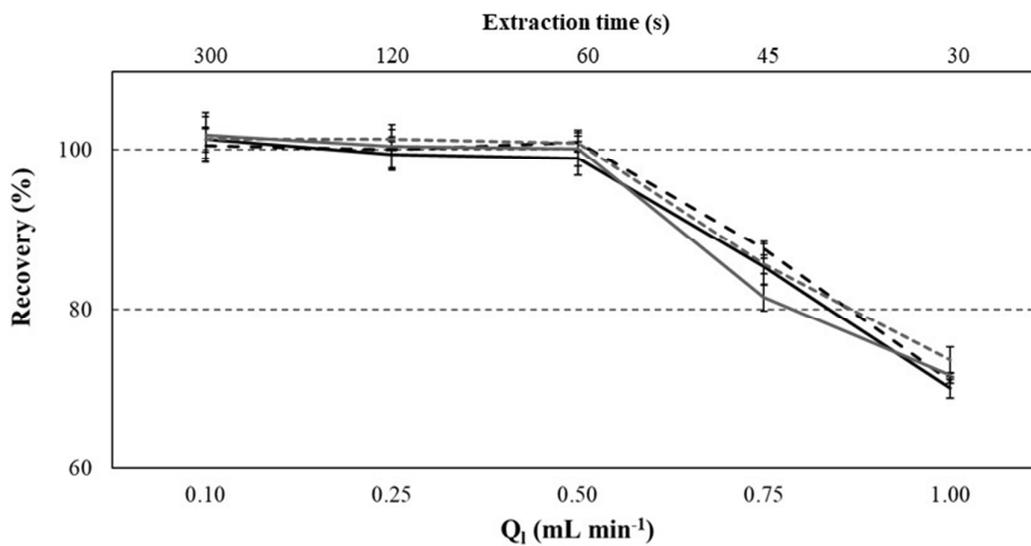


Figure S2. Effect of the liquid flow rate (Q_1) and extraction time on the recovery. $[\text{HNO}_3] = 0.1 \text{ mol L}^{-1}$; $r(\text{m}_{\text{Organic phase}}/\text{m}_{\text{Aqueous phase}}) = 0.5$; $Q_g = 0.4 \text{ L min}^{-1}$; Nebulizer tip to organic phase gap = 1.5 cm. Black lines: Ca; Dotted black lines: K; Dotted grey lines: Mg; and, Grey lines: Na.

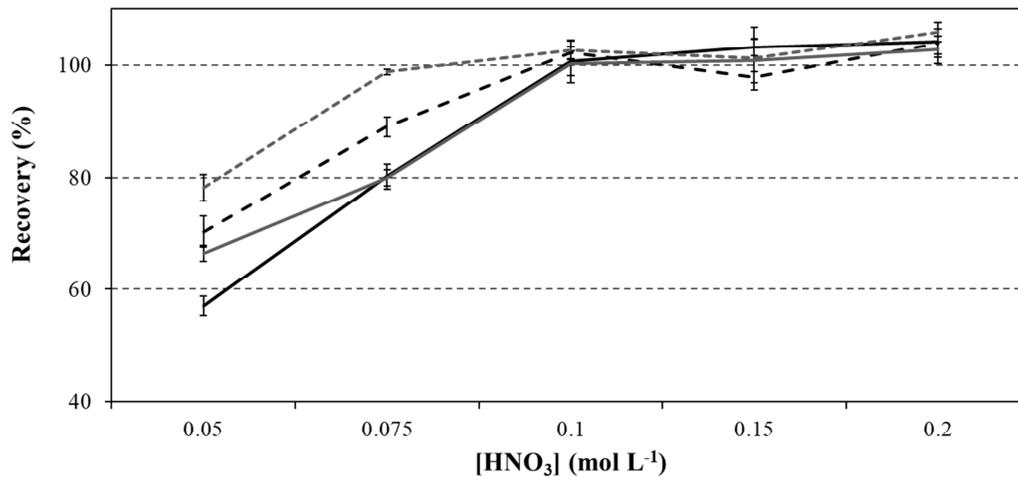


Figure S3. Effect of nitric acid concentration on the recovery. $r(m_{\text{Organic phase}}/m_{\text{Aqueous phase}}) = 0.5$; $Q_l = 0.5 \text{ mL min}^{-1}$; $Q_g = 0.4 \text{ L min}^{-1}$; Extraction time: 60 s; Nebulizer to sample surface gap = 1.5 cm. Black lines: Ca; Dotted black lines: K; Dotted grey lines: Mg; and, Grey lines: Na.

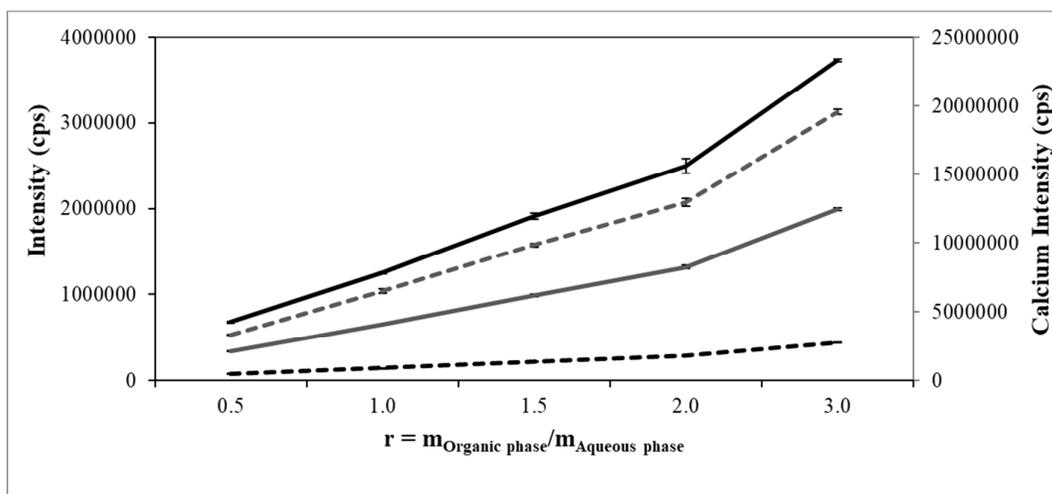


Figure S4. Effect of the aqueous to organic phase mass ratio (r) on the emission intensity. $[\text{HNO}_3] = 0.1 \text{ mol L}^{-1}$; $Q_l = 0.5 \text{ mL min}^{-1}$; $Q_g = 0.4 \text{ L min}^{-1}$; Extraction time:

60 s; Nebulizer tip to organic sample surface gap = 1.5 cm. Black lines: Ca (secondary axis); Dotted black lines: K; Dotted grey lines: Mg; and, Grey lines: Na.