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Micro-SI system for the spectrophotometric bi-parametric determination of iron and copper in soil leachates

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In the present work, a micro-sequential injection lab-on-valve (μ SI-LOV) system with spectrophotometric detection for the simultaneous determination of copper and iron is described. For the copper determination, the well-known reaction with 1-(2-Pyridylazo)-2-naphthol (PAN) was used while for the determination of iron a recently described chromogenic reagent, MRB12, was explored. The latter ligand is a pegylated 3-hydroxy-4-pyridinone (3,4-HPO) with improved hydrophilicity allowing an increase of the method sensitivity and providing a lower detection limit when compared to N-alkyl-3-hydroxy-4-pyridinones.

The present μ SI-LOV technique minimizes reagents and sample consumption, thus leading to a more sustainable procedure. A detailed study of the operation parameters for both determinations was performed and the obtained features are summarized in the Table. The intra-day precision of the developed system has been assessed by RSD calculation: <3% and <6% for Cu and Fe, respectively. The accuracy was evaluated by recovery studies calculated for two levels of addition for seven water samples from different sources with average percentages of 107% for iron and 102% for copper.

Analyte	Dynamic range (mg/L)	Typical calibration curve ^a $A = S \times \text{mg M}^{n+}/L + b$	LOD ($\mu\text{g/L}$)	LOQ ($\mu\text{g/L}$)	Determination rate (h^{-1})	Effluent production (μL)
Fe(III)	0,06-1,00	$A = 0,044 \pm 0,004 \times [\text{Fe}^{3+}] + 0,0056 \pm 0,0003$ $R^2=0,9977 \pm 0,0017$	18	60	50	695
Cu(II)	0,05-1,00	$A = 0,159 \pm 0,005 \times [\text{Cu}^{2+}] + 0,0157 \pm 0,0008$ $R^2=0,9995 \pm 0,0004$	15	51	47	813

^a_n = 8

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