Exploiting the lab on valve concept to study the 3,4-HPO chelator as non-toxic reagent for the determination of iron in coastal and inland bathing waters

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The speciation of iron(II) and iron(III) in dynamic water systems usually implies the determination with highly toxic reagents. In this context, low toxicity iron chelators, derived from 3-hydroxy-4-pyridinone (3,4-HPO) ligands used as chromophores, can be seen as a greener alternative. The use of 3,4-HPO chelators as iron reagents requires a detailed study of the reaction conditions and a comprehensive interference study. To be considered an effective alternative, similar (or better) sensitivity should be obtained when compared to commonly used reagents together with non-significant interferences.

Bathing waters, coastal and inland, present a challenging matrix due to the expected variety of parameters. In fact, these waters are often highly stressed due to recreational activities, so the efficient monitoring of parameters such as iron(II) and iron(III) represents a valuable contribution to the overall environmental assessment. These samples have a set of different characteristics and parameters namely salinity. Furthermore, the expected low levels of iron may result in the potential need for a pre-concentration step.

In this work, the versatility of micro sequential injection analysis in a lab on valve (LOV) format was used to study the determination of iron with the 3,4-HPO chelating agent. The reaction conditions were optimized and the interferences evaluated. Then, the aimed water samples, bathing waters, were analyzed. Additionally, with the aim of pre-concentrating iron, NTA resin was placed at the flow cell to retain the iron prior to the reaction with the chelating agent.

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