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Optimising ICP-MS Analysis: Enhancing Helium Collision and Reaction Cell Modes.

CLINT WALKER AND **BASTIAN GEORG**

Agilent Technologies

Inductively Coupled Plasma Mass Spectrometry (ICP-MS) is a key analytical technique for trace elemental and isotopic analysis. Traditionally, the use of collision/reaction cell (CRC) gases such as helium and oxygen has been somewhat element-specific, requiring detailed method development and frequent gas switching to optimize sensitivity and eliminate interferences.

This study examines the effectiveness of an enhanced single helium mode for analysing all elements, with the aim of simplifying laboratory workflows without compromising analytical performance. Our results show that operating ICP-MS in enhanced collision mode provides reliable interference removal across a broad suite of elements, including those that are traditionally challenging to analyse. The simplicity of this approach significantly reduces method complexity and instrument time associated with gas switching, thereby improving sample throughput and reproducibility in multi-element analysis.

We also introduce a new reaction mode in the CRC, offering a sustainable, cost-effective, and safer alternative to bottled oxygen. Experimental data indicate that we can achieve similar levels of interference removal and analytical performance for elements such as sulphur, phosphorus, and arsenic, which typically require oxygen for optimal detection. This further streamlines laboratory operations by eliminating the need for a dedicated oxygen-supply infrastructure.

Together, the enhanced He mode and the new reaction mode can transform routine ICP-MS analysis by optimizing simplicity, safety, and cost-effectiveness, thereby making high-quality elemental analysis more accessible across various laboratory settings.