hydrideICP

Superior Sensitivity for Hydride-forming Elements

Automatically generates hydride gas to deliver up to 100x higher sensitivity for hydride-forming elements

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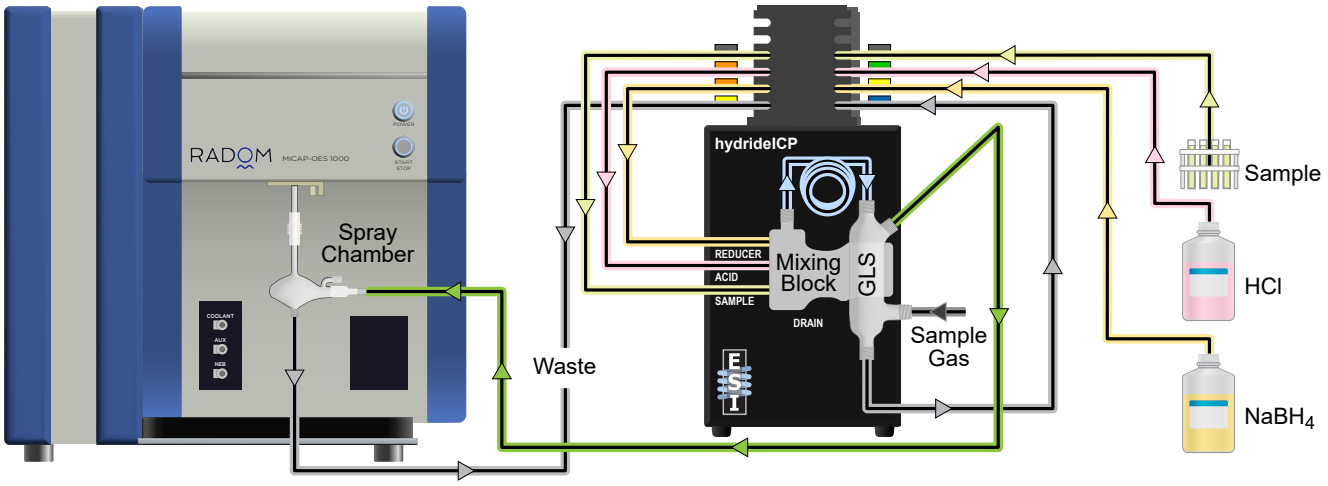
Improving Sensitivity in Hydride-forming Elements with hydrideICP Sample Introduction on RADOM MICAP-OES 1000

Synopsis

hydrideICP is a hydride generation sample introduction system that converts hydride-forming elements, including arsenic, mercury, antimony, and selenium, into volatile gas for direct introduction into the ICP. Gas-phase transport improves sensitivity by increasing analyte transport efficiency while minimizing matrix interferences. This results in up to 100x lower limits of detection (LOD) compared to direct sample introduction systems. Trace-level quantitation in complex matrices is significantly improved through conversion of analytes to volatile hydrides and their efficient transfer to the plasma. This work evaluates the improvement in sensitivity relative to conventional pneumatic nebulization and validates performance using spike recovery in tap water.



hydrideICP paired with the RADOM MICAP-OES 1000. Sample, HCl, and $NaBH_4$ are mixed together inside a fluoropolymer mixing block to create hydride gas inside the GLS (gas liquid separator). The instrument's nebulizer gas can be used to propel the hydride gas into the instrument via ESI's universal spray chamber adapter.

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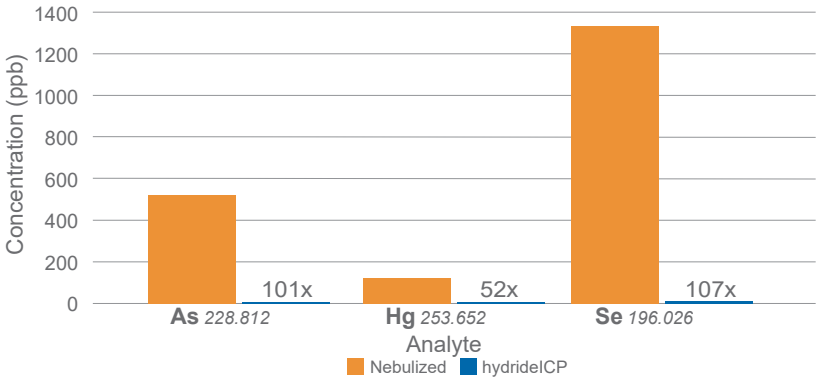
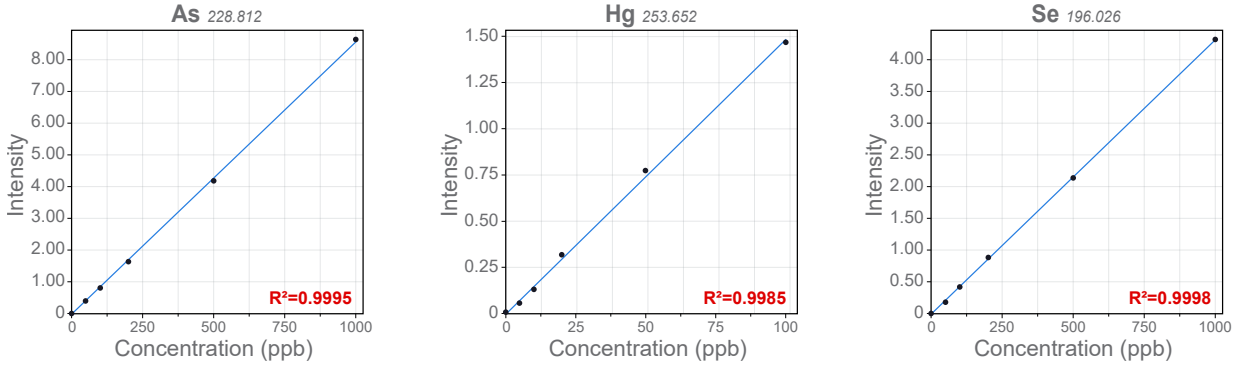
Sensitivity Improvement with hydrideICP on MICAP

Detection Limit Comparison: Pneumatic Nebulization vs. hydrideICP Introduction



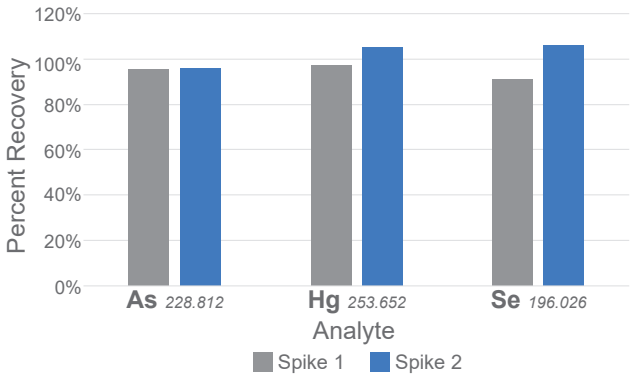
This graph shows the LOD for hydride-forming analytes compared to pneumatic nebulization on the MICAP-OES 1000 with the sensitivity improvement factor for each analyte. The hydrideICP DLs for As, Hg, and Se were 5.0, 2.3, and 12.3 ppb, respectively, proving that the hydrideICP provides more than 50x improvement to detection limits compared to direct sample introductions systems.

hydrideICP Calibration Curves



Calibration curves of hydride-forming elements with hydrideICP demonstrated excellent linearity. Standard concentrations for As and Se were 50, 100, 200, 500, and 1000 ppb. Standard concentrations for Hg were 5, 10, 20, 50, and 100 ppb.

Percentage Spike Recovery in Tap Water



Tap water was selected as a representative aqueous matrix to verify method accuracy via spike recovery. Samples were acidified with 5% HNO_3 and 5% HCl, then spiked at two levels to evaluate recovery performance across the calibration range: 75 ppb As/Se and 7.5 ppb Hg (Spike 1), and 200 ppb As/Se and 20 ppb Hg (Spike 2). Data shown represent the average of five replicates, demonstrating consistent quantitative recovery across the working range.

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