ELEMENTAL AND ISOTOPE RATIO MASS SPECTROMETRY: A QUIET REVOLUTION

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ELEMENTAL ABUNDANCES can be measured with a wide variety of techniques, but ICP-MS, particularly high resolution ICP-MS (HR-ICP-MS) is becoming a definitive method for many analyses formerly done optically, including multielement analyses (ICP-OES), elemental suites (REE-NAA), oligoelement limit of detection analysis (Fe-GFAA, P-colorimetry). UV laser ablation-HR-ICP-MS provide detection limits superior to those from electron microprobes. ELEMENTAL RATIOS calculated using measurements obtained from different techniques can be done directly with HR-ICP-MS (e.g. X:Ca). ISOTOPE RATIOS have been the bailiwick of TIMS and IRMS for 40 years. While the ultimate precision attainable with TIMS has improved, isotopic systematics formerly the exclusive province of TIMS are being done by ICP-MS, both HR-ICP-MS and multiple collector (MC) ICP-MS. MC-ICP-MS allows investigation of mass dependent fractionation of previously intractable elements (e.g. Cu, Zn). UV lasers used with IRMS, HR-ICP-MS and MC-ICP-MS provide measurements formerly only possible with ion microprobes. MOLECULAR RATIOS (e.g. N2/O2) are now directly accessible on IRMS. SPECIATION (GC, LC, CE, FFF) prior to mass spectrometry has opened up isotope fingerprinting at the molecular level and allows unprecedented characterization of the speciation of trace elements.