

Analysis of Mn and Fe coatings on stream pebbles by laser ablation microprobe-inductively coupled plasma-mass spectrometer (LAM-ICP-MS): a tool for environmental monitoring and geochemical exploration

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Pebbles from fluvial systems are commonly coated with Fe and/or Mn oxide coatings. These oxide-coatings absorb and concentrate metals from solution and hence provide a gauge of metal abundances in water integrated over time. Many elements of interest in both environmental monitoring and mineral exploration are below the limits of detection in water for most analytical methods; both types of research require delineation of anomalous concentrations vs. background. LAM-ICP-MS is a method of multi-element analysis

of very small amounts of sample such as thin oxide coatings on pebbles. In order to test the potential of LAM-ICP-MS for the analysis of Fe-Mn oxide coating, a series of stream pebbles were collected from two fluvial systems; one flowing through a metropolitan area and the other draining a relatively undisturbed natural environment with known base metal geochemical anomalies.

Based on analytical response, a suite of 17 elements (including Pb, Zn, Cu, Co, As, Be, Ba, S, Sb, I, Fe, Mn, Ti,

Mo, B, Sn and Ce) could be adequately determined in coatings from the city stream, and this suite together with U, Hg and Ag were determined from the undisturbed stream. Signals for most elements appear to better correlate with Fe, except Zn which shows a much closer relationship with Mn.

Ratios of heavy metals for Fe and Mn in coatings from the city stream increase downstream. The technique is fast and relatively inexpensive for both environmental monitoring and mineral exploration.