

Recent Advances in the Chemical Analyses Techniques for Use in International Geochemical Mapping Programs

BALARAM, V. National Geophysical Research Institute, Hyderabad - 500 007, India

The analytical instruments used for geochemical mapping programs should have very high throughput and be able to detect and precisely estimate more than 70 elements with limits of detection significantly below the crustal abundance levels. The sample decomposition methods, separation and pre-concentration procedures and the quality control protocols followed during analytical programs should be strictly in accordance with the international guidelines. Among the instrumental analytical techniques currently in use, F-AAS, GF-AAS, XRF, INAA, ICP-AES, ICP-MS and HR-ICP-MS are important for geochemical mapping applications. The ICP-MS with its sensitivity combined with essentially simultaneous multi-element capability had made a tremendous impact in this area for more than a decade. The newly developed HR-ICP-MS which is taking the detection limits for most elements to parts per quadrillion (ppq) levels with extremely accurate analysis of several trace elements in geological and environmental materials, will play a prominent role in geochemical mapping programs in future.

Most of these instrumental analytical techniques require samples in the form of solution for chemical analysis. Chemical and mineralogical properties of the samples, the elements of interest, etc., make it necessary to choose sample decomposition techniques to meet the objectives of the analysis. Advances in laboratory microwave-oven systems (both open and closed) have put the sample preparation on par with the capabilities of instrumental analytical techniques at present. Use of Certified Reference Materials (CRMs) for calibration as well as control samples is an indispensable part of the quality assurance protocols followed during the chemical analysis. They play a key role in the demonstration of the reliability of analytical data.