

## WAVELENGTH-DISPERSIVE X-RAY FLUORESCENCE SPECTROMETRIC DETERMINATION OF BARIUM IN SILICATE-ROCKS USING BaK $\alpha$ : COMPARISON OF RESULTS FROM DIFFERENT X-RAY EXCITATION SOURCES

S. Viswanathan<sup>1</sup> and K. Surya Prakash Rao<sup>2\*</sup>

<sup>1</sup> Flat B-203, Block-B, United Avenue Apartments, South End,  
7-1-29, Ameerpet, Hyderabad

<sup>2</sup> 1-2-98, Kakatiyanagar, Habsiguda, Hyderabad  
E-mail: ksprao1939@yahoo.co.in

### Abstract

Barium is an important trace-element in silicate-rocks, especially in granitic rocks. The Ba/Rb ratio can be used to determine if a granitic rock formed from a highly evolved melt or not. As the atomic number (Z) of barium is high (Z = 56), we have to use the characteristic radiations of barium from the x-ray L spectrum. The available analytical lines are BaL $\alpha$ , BaL $\beta_{1,3}$ , and BaL $\gamma_1$ . BaL $\alpha$  is overlapped by TiK $\alpha$ . BaL $\beta_{1,3}$  is liable to interference from CeL $\alpha$ . BaL $\gamma_1$  is weak. The availability of 100 kV x-ray generators makes it possible to use BaK $\alpha$  to determine barium in silicate-rocks.

The paper proposes a simple, accurate, precise, rapid, and non-destructive technique to determine barium in silicate-rocks by wavelength-dispersive x-ray fluorescence spectrometry (WDXRFS) using BaK $\alpha$  and five different x-ray excitation sources (gold, tungsten, rhodium, silver, and molybdenum) and compares the results obtained with respect to accuracy, precision, and lower limits of detection. The technique uses a sequential x-ray fluorescence spectrometer, 100 kV–80 mA–3 kW x-ray generator, LiF 220 analyzing crystal, fine (150  $\mu$ m) collimator, air path, scintillation counter, and short counting times. The international rock standards, BCR-1, AGV-1, W-1, G-1, G-2, GSP-1, GA, and GS-N, were used as analytical standards.

The accuracy and precision of the technique are excellent (within 1%). The lower limits of detection for the five different x-ray excitation sources are: 23 ppm (gold); 23 ppm (tungsten); 30 ppm (rhodium); 35 ppm (silver); and 88 ppm (molybdenum). The time taken to determine barium in a batch of twentyfour samples of silicate-rocks, for a replication of four analyses per sample, by one operator, using a manual wavelength-dispersive x-ray fluorescence spectrometer, is only six hours.

**Keywords:** X-ray fluorescence spectrometry, WDXRFS, Barium, BaK $\alpha$ , Silicate-rocks.

