

**DETERMINATION OF VANADIUM, CHROMIUM, COBALT, NICKEL,  
COPPER, ZINC, BARIUM, AND LEAD IN GRANITIC  
ROCKS BY WAVELENGTH- DISPERSIVE X-RAY  
FLUORESCENCE SPECTROMETRY**

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**Abstract**

The paper proposes a simple, accurate, precise, rapid, and non-destructive wavelength-dispersive x-ray fluorescence spectrometric technique for determining vanadium, chromium, cobalt, nickel, copper, zinc, barium, and lead in granitic rocks. The technique uses a vacuum x-ray spectrograph, 60 kV- 40 mA- 2 kW x-ray generator, tungsten x-ray tube, LiF 200 analysing crystal, coarse collimator, vacuum path, gas-flow proportional counter, short counting times, and the international rock standards, G-1, G-2, GSP-1, DTS-1, PCC-1, BCR-1, W-1, and AGV-1.

The accuracy of the proposed technique is excellent (within 1% for chromium, copper, zinc, barium, and lead; within 2% for vanadium and nickel) and very good (within 4% for cobalt). The precision is also excellent (within 1% for copper, zinc, barium, and lead; within 2% for vanadium, chromium, and nickel) and very good (within 5% for cobalt). The lower limits of detection for the eight elements are: 1 ppm for chromium, cobalt, nickel, copper, and zinc; 2 ppm for vanadium and lead; and 5 ppm for barium. The time taken for determining vanadium, chromium, cobalt, nickel, copper, zinc, barium, and lead in a batch of twentyfour samples of granitic rocks, for a replication of four analyses per sample, by one operator, using a manual x-ray fluorescence spectrometer, is only twentyfour hours.

*Keywords:* X-ray fluorescence spectrometry, WDXRFS, Granitic rocks, Vanadium, Chromium, Cobalt, Nickel, Copper, Zinc, Barium, Lead.