

Geochemistry, economic geology and health hazard assessment of the phosphate deposits of Paswal Mian and surrounding areas, District Abbottabad, Khyber Pakhtunkhwa, Pakistan

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Abstract

Pakistan is a leading agricultural country and almost 70% of its population is dependent directly on agriculture practices. Phosphorous is vital for plants growth and yield. Besides a number of other sources phosphorous commonly occurs in phosphate deposits. Phosphate bearing rocks are present in different horizons including Precambrian-Cambrian, Late Jurassic-Early Cretaceous, Paleocene, Eocene and Oligocene. In Pakistan most of the economical phosphate deposits occur in the Cambrian rocks of Hazara. These deposits are present in the upper part of Abbottabad Formation of Cambrian age and are widely distributed in Hazara region and extended up to Kashmir. In the study area, the phosphate rock generally occurs in association with dolomite of Abbottabad Formation in the form of thin lenses but sometime it bulges up to several feet and occurs 30-40 feet above the quartzite member.

The representative samples were collected from the phosphate beds exposed in three localities (i.e, Paswal Mian, Banseri and Shakot) in Abbottabad District. These samples were analyzed for major and trace elements using Atomic absorption spectrometer and UV/VIS spectrophotometer in the Geochemistry Laboratory of the National Centre of Excellence in Geology, University of Peshawar. The major element oxides are highly variable. SiO₂ is in the range of 7.35-57.35 wt%, Al₂O₃: 0.52-6.2wt%, TiO₂: 0.01-0.25wt%, Fe₂O₃: 0.23-2.11wt%, MnO: 0.01-0.11wt%, MgO: 0.04-15.01wt%, CaO: 18.77-60.17wt%, Na₂O: 0.18-0.62 wt%, K₂O: 0.02-0.30 wt% and P₂O₅: 1-25 wt%. Among the trace and heavy metals, Cu varies from 1.05-13.25ppm, Cr from 6.64-27.5ppm, Ni from 1.25-44.5ppm, Zn from 11.95-269.35ppm, Co from 0.05-10.4ppm, Pb from 17.9-209ppm and Cd from 0.65-5.3ppm.

Geochemically, the phosphate rocks of the study area are having economic concentration of P₂O₅ with the required major oxides which can be utilized in the manufacturing of fertilizer. The concentration of heavy and trace elements are also within the safe limits of WHO and will, therefore, not pose any kind of environmental problems if used in fertilizer for agriculture purposes. This preliminary study on the studied phosphate rocks is indicative of occurrence of other phosphate deposits of similar types in the region. Therefore, further detailed study in the region is suggested.