Phosphate resources of Zambia and progress in their exploration

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Introduction

Zambia currently imports all its requirements of phosphate fertilizer compounds. Because Zambia is a landlocked country with long supply routes, freight is an expensive item. Importing fertilizers places a heavy burden on Zambia’s limited foreign exchange resources. The Government has placed a strong emphasis on improving agricultural output. The development of self-sufficient production of phosphate fertilizer is one of the important and urgent tasks facing Zambia’s agricultural and mining industries. Intensive exploration efforts undertaken, especially since 1980, have led to some interesting discoveries of phosphate bodies and also to a better understanding of the nature of this mineralization. Four major phosphate occurrences have been located and investigated in detail. Other minor locations have also been encountered, but they are considered far below the limits of economic interest and therefore have not been included in this report.

Only igneous types of phosphate deposits are encountered in Zambia. Two varieties of such deposits are recognized:
- Carbonatite-related deposits
- Syenite-related deposits

Carbonatite-related phosphates are found at Kaluwe (Central Zambia) and Nkombwa Hill (Northern Zambia). Syenite-related phosphates were located in the Chilimbwe area (eastern Zambia) and north of Mumba in central Zambia (Fig. 1). The syenite-related phosphates in both cases are located within syenite bodies bordering large granite batholiths.

Review of geological exploration

The first discoveries of phosphate-bearing bodies in Zambia were the result of a geological survey mapping of Zambia in the 1950s. The bodies located at this time were large carbonatites found within the Luangwa Rift Valley System. Nkombwa Hill, in the northern part of Luangwa Valley, and the Rufunsa Valley group of carbonatites, from which the Kaluwe carbonatite was reported to be the most prominent, were discovered (Fig. 1) during this survey. Originally the economic interests were focused on the Nb and Ta-bearing minerals. Nkombwa Hill was described by Reeve and Deans [14]. Studies of Rufunsa Valley carbonatites, including Kaluwe, were published by Bailey [1, 2]. The initial carbonatite discoveries were low grade and therefore did not raise a lot of interest.

The next stage of exploration began in the late 1970s when MINEX (of Zambia Industrial and Mining Corporation, Ltd. [ZIMCO]) began intensive studies of both locations. This most recent program aimed for the first time at locating phosphate deposits, and it is still in progress. A detailed auger drilling survey of the Kaluwe carbonatite proved the deposit to be uneconomic. Further exploration efforts concentrated on small but higher grade occurrences of phosphates located within the syenitic bodies, traces of which have been encountered during regional prospecting for base metals.

Geochemistry, geophysics, classical geological mapping in very detailed scale, trenching, pitting, and drilling (percussion, auger, and diamond) have been employed to survey phos-
phosphate occurrences. Cooperation of foreign collaborators, i.e., Serrana (Brazil), Kemira Oy, NED (Finland), and JICA (Japan) has been solicited at various periods of time.

**Kaluwe carbonatite**

The Kaluwe carbonatite is the most prominent of four bodies located in the Feira-Rufunsa region of Zambia (Fig. 1, No. C). The others (Chasweta, Mwambuto, and Nachomba) lie to the south of Kaluwe. These bodies are smaller with negligible $P_2O_5$ contents and are of no economic value. The age of the carbonatite intrusion is inferred to be related to prominent faulting activity of Jurassic age. This dating correlates the Kaluwe carbonatite with the well-known Chilwa carbonatite series of southern Malawi.

The Kaluwe carbonatite forms a cuesta-shaped east-west trending hill rising approximately 60 m above surrounding valleys and extending for 10 km along strike with an average width of 1.5 km. The carbonatite was injected as a large sill into surrounding Karroo sandstones. The body is composed of three agglomeritic brec-