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Phosphate mineralization at Jacobina do Piauí municipality, Jaguaribeano Belt, Southeastern Piauí State, Brazil

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Abstract

Phosphate-bearing siliceous breccias and massive rocks have been found by the CPRM-Geological Survey of Brazil team in the Riacho do Pontal Belt, southeastern Piauí State, during a geological mapping program. The rocks crop out within a Cenozoic detrital-lateritic sequence that covers Paleoproterozoic metamorphic rocks of the Neoproterozoic Jaguaribeano Belt. Semi-quantitative phosphorous concentrations have punctually been determined by portable X-ray fluorescence, yielding the following values: up to 32% P2O5 in the breccia matrix, up to 28% P2O5 in fragments others than quartz, 16% P2O5 in whole-rock breccia powders, and up to 9% P in the siliceous rock. Ongoing petrographic, SEM, XRD and whole-rock geochemistry studies will help in a better characterization of the phosphate mineralization.

Keywords: Phosphate, hydrothermal breccia, Jaguaribeano Belt.

INTRODUCTION

Field work developed by the team of the Project "Geological Integration and Mineral Resources of Marginal Belts of the North-Northwest Border of the São Francisco Craton - Riacho do Pontal Subarea, Borborema Province", resulted in the discovery of an occurrence of phosphate rocks in the Poço Danta locality, Jacobina do Piauí municipality, in southeastern Piauí State, Northeast Brazil (Figure 1). The project, developed by the CPRM team based in Teresina, Piauí State, is part of the Evaluation of Mineral Resources of Brazil program, linked to the Strategic Management of Geology, Mining and Mineral Transformation major program and is sponsored by the Growth Acceleration Program-PAC 3.

GEOLOGICAL CONTEXT

The phosphate occurrence was discovered in a region with predominance of colluvium-eluvium cover composed of sandy, sandy-clayish and conglomeratic sediments (Figure 1), overlying Precambrian rocks of the Jaguaribeano Belt, including: 1) Neoproterozoic calc-alkaline, medium- to high-potassium granitoid plutons, pertaining to the Itaporanga Supersuite (Almeida et al. 1967); 2) Neoproterozoic mafic to intermediate rocks, composed of gabbros, granodiorites and diorites (Melo 1991); and 3) Ipueirinha meta-volcanosedimentary sequence, of Paleoproterozoic age (Bizzi et al. 2003), constituted by chlorite schists, sericite-chlorite schists and albite-chlorite schists (Melo 1991).

PHOSPHATE OCCURRENCE DESCRIPTION

The phosphate mineralized rocks crop out in a hill (Figure 2) striking ENE-WSW, concordant to the main regional structures (Figure 1). The mineralization, identified in three outcrops along a 6.5 km trend, is 40 to 400 m wide and is partially covered by eluvium-colluvium sediments, well-defined on aerial geophysical maps (Figure 3). The relief is sustained by a silicified rock, white to pinky in color, with abundant stockwork veins filled mostly by quartz (Figure 4) and, less commonly, by fine films of green material of nature not yet characterized. Semicircular druses permeate the silicified rock, and there are some comb-textured quartz veins, denoting epigenetic and shallow characteristics.

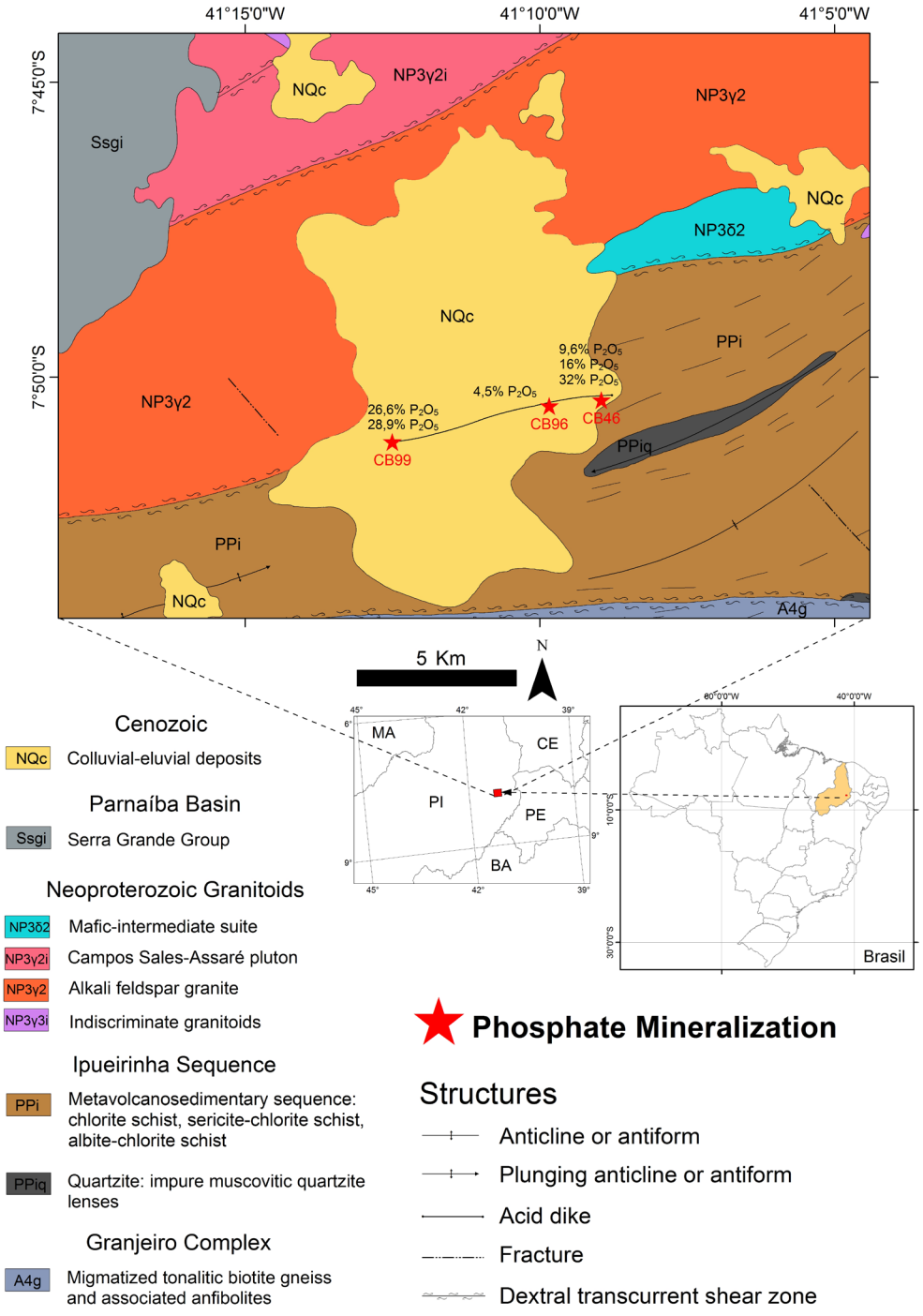

Figure 1 - Geological map (modified from Melo 1991) with location of phosphate occurrences.

Figure 2- *Overview, aside (hill at first plan) an elevation with phosphate rocks (CB-46 outcrop).*

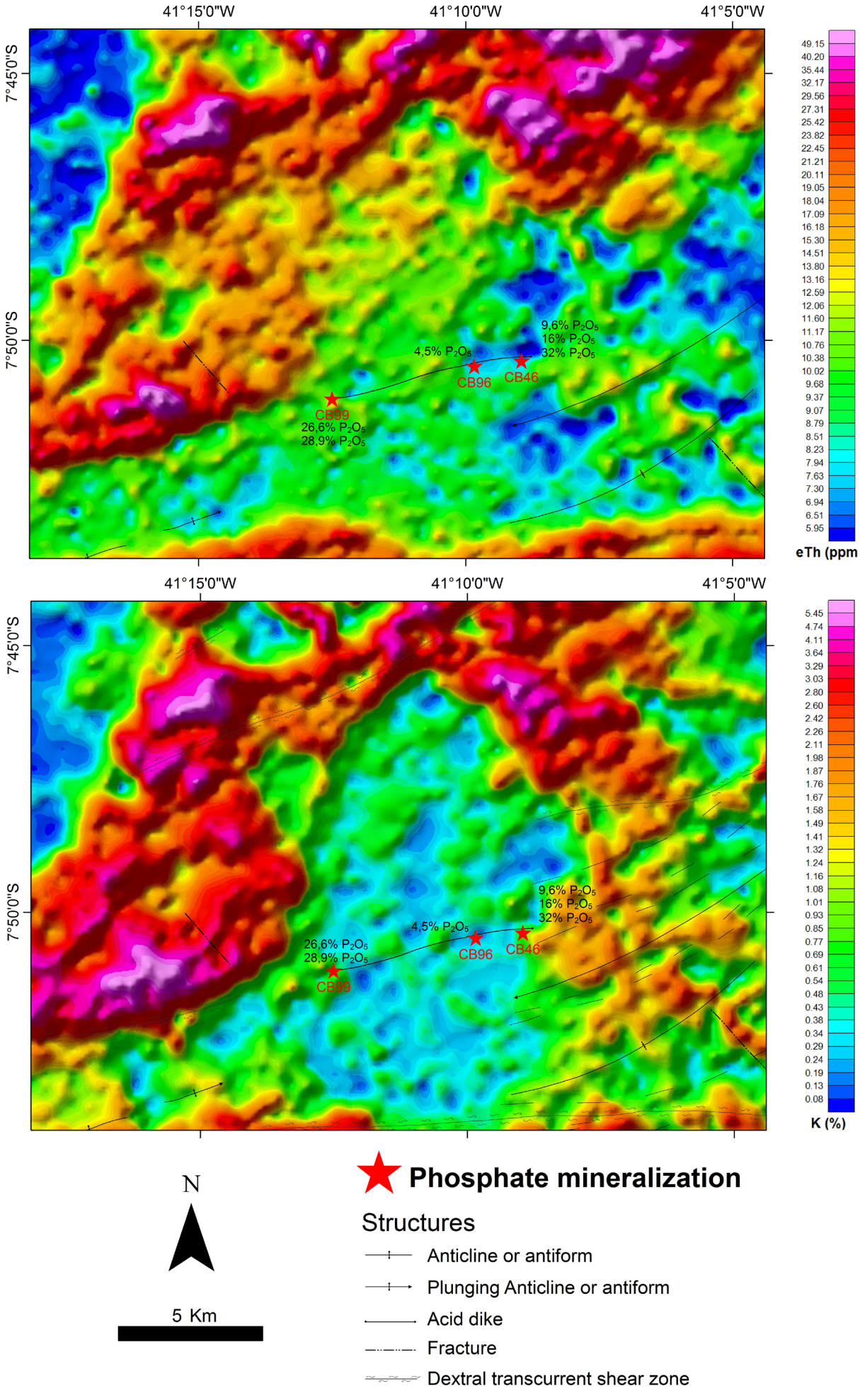

Figure 3- *Maps of radioelements: equivalent thorium and potassium.*

The mineralization is hosted mainly by phosphate-rich breccias (Figures 5 and 6) associated to a quartz stockwork zone (Figure 4). Those rocks were previously mapped by Melo (1991) as an ENE-WSW striking acidic dike (Figure 1) cropping out within a Quaternary cover unit.

The breccia shows a framework composed of fragments of varied sizes and forms, from angular to subrounded, with diameter between 1 mm and 1 m. The largest fragments are constituted only by quartz (Figure 5), while the smaller ones vary from pebble to granule in size and are formed by quartz and beige to greenish supergene material (Figure 6). The matrix is fine-grained, yellow in color, and surrounds the breccia fragments, in some portions originating concentric coats or films similar to pisolites (Figure 7). Particularly in the southwestern portion of the know mineralized zone, brecciated floats may show yellow rounded pebbles, with a phosphate-rich matrix.

SEMI-QUANTITATIVE ASSAYS

Spot analyses of the samples (Table 1) performed with portable X-Ray Fluorescence equipment showed grades of up to 9% P2O5 for silicified material, 32% P2O5 in breccia matrix, and 28% P2O5 in non-quartzose fragments (Figure 6), in addition to an average grade of 16% P2O5 in powdered sample of phosphate breccias (Table 2).

Figure 4 - *Silicified phosphate material with quartz stockwork (CB46 outcrop).*

Figure 5 - *Phosphate breccia with large fragments (clasts) of quartzose composition (CB46 outcrop).*

Figure 6 - *Small breccia fragments with supergenic alteration (CB46 outcrop).*

Figure 7 - *Breccia with rounded phosphate pebbles, similar to pisolites, and angular grains of quartz immersed in a grey matrix (CB99 outcrop).*

Table 1 - *Location of the samples with phosphate mineralization*

SAMPLE	COORDINATES (decimal degrees)	
	Latitude	Longitude
CB-46	-7,839860°	-41,149216°
CB-96	-7,841488°	-41,163954°
CB-99	-7,851685°	-41,208314°

Table 2 - *P2O5, Al2O3 and CaO grades obtained with portable XRF.*

OUTCROP	GRADES (%)		
	P_2O_5	CaO	Al_2O_3
CB-46	32,51	0,05	11,46
	15,99	0,91	9,6
	9,99	0,32	7,03
CB-96	4,46	1,25	12,99
CB-99	26,59	0,36	10,28
	28,92	0,14	11,23

FINAL COMMENTS

Preliminary field data, including the lack of sedimentary structures and abundance of breccias and stockworks, suggest hydrothermal breccia formation affected by supergenic processes.

Petrographic (including scan electronic microscopy), lithogeochemistry and X-ray diffraction studies are being performed for better understanding of the composition, origin and importance of this mineralized body.

REFERENCES

ALMEIDA, F. F. M. de; LEONARDOS JR., O. H.; VALENÇA, J. - 1967 - Granitic rocks of North-East South America. In: INTERNATIONAL UNION OF GEOLOGICAL SCIENCES, Recife, 1967. Recife: IUGS/UNESCO. 41p.

BIZZI, Luiz Augusto (Ed.) et al. - 2003 - Geology, tectonics and mineral resources of Brazil: text, maps and GIS. Brasília. CPRM. 673p.

MELO, F.; VASCONCELOS, A. M. (Org.) - 1991 - Programa Levantamentos Geológicos Básicos do Brasil. Patos. Folha SB.24-Y-C-V. Estado do Piauí, escala 1:100.000. Brasília. DNPM/CPRM. 135p.

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