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COLTAN in Colombia: strategic or conflict material?

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The Colombian part of the Amazonian Craton constitutes less than 10% of this Precambrian nucleus of South America, with outcrops in the eastern Vichada, Guainía, Vaupes, Caquetá and Guaviare departments, but most of the craton is covered by Tertiary and Quaternary sediments as well as by tropical forest. As with nearly all eastern Colombia it is inhabited mainly by indigenous tribes but serves also as an important region for illegal armed groups that use this inaccessible area to hide from the Colombian State and carry out illicit activities including mining in protected natural parks, in some cases controlled by the FARC, or to launder money from the drug trafficking.

Important mining sites use alluvial and supergene deposits where valuable minerals are concentrated near the primary source rocks. Our research revealed that strategic minerals formed since the Mesoproterozoic by several metamorphic, magmatic and sedimentary events, outcrop in metasedimentary and granitic mountains and inselbergs. For example, wolframite from the Zancudo site in the central Guainía department is a greisen-type hübnerite associated with gold and bismuth hosted in metasedimentary rocks of the Maimachi Formation. Nb-Ta-rutile and columbite from south Guainía department are in pegmatites related to Mesoproterozoic A-type granites. Some columbite-tantalite occurrences in alluvial deposits are associated with beryl. High uranium and thorium contents may serve as an exploration indicator for in-situ or placer deposits, but also make their commercialization difficult.

Figure 1 Colombian army raiding illegal W-Au-Bi mines related with FARC in Guainía department.

Coltan is a colloquial word used initially in Africa for ore containing tantalum and niobium. However, in Colombia any black heavy mineral easily extractable from alluvial deposits using panning by indigenous people or settlers is known as coltan. Tonnes of ilmenite, rutile and magnetite have been extracted and carried to Bogotá for marketing as coltan without profit, while others consignements have been confiscated by Colombian police. This confiscated coltan rarely has notable tantalum or niobium contents. However, genuine gold, wolframite, coltan (high U-Th) and cassiterite exploitation does take place at some localities, often carried out by indigenous people for whom it is their *modus vivendi*. LA-ICP-MS U/Pb dating of zircons and Nb-rutiles from alluvial deposits in the Vichada department suggest sedimentary transport from Venezuelan granites (1500 Ma) associated with Nb-, Ta-, REE- and Sn mineralizations.

The continuous exploration of the Amazonian jungle often leads to the finding of new deposits. In Brazil, Venezuela and Bolivia some of them are mined by private or government companies, but in Colombia with regions disputed by guerillas or drug traffickers who disturb the lives of indigenous civilians and damage sensitive ecosystems, there is a concern about mining in general. Only political decisions that take serious account of social and environmental issues in the context of the actual peace process will allow Colombia to use its mineral resources without major damage.

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