MINERALOGICAL CHARACTERIZATION OF ALLUVIAL GOLD MINING TAILINGS IN THE NORTH OF THE COUNTRY

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In Ecuador there are five mining districts: Esmeraldas, Daule - Quevedo, Puyango – Balao, Zamora Chinchipe – Upano and Paztaza. One of the oldest mining spots in northern Ecuador is the Santiago River alluvial deposits, located in Esmeraldas province. The Coastal Region is formed by many basins where rich materials were deposited as foothills and alluvial fans; these sediments contain precious minerals. however, artisanal mining operations had focused on the extraction of alluvial gold only. This research aims to identify economically valuable minerals present in the sands. These sands are the byproduct or waste of artisanal mining activities in the region. Additionally, the project seeks to provide valuable insights into the development of artisanal and illegal mining in the country, as well as the minerals being extracted and those yet untapped in this activity. To achieve these objectives, detailed analyses of samples were conducted using various analytical techniques, including point counting and descriptive mineralogy. Advanced optical techniques were also employed, such as X-ray Diffraction (XRD), Raman Spectroscopy for sediments, X-ray Photoelectron Spectroscopy (XPS), Inductively Coupled Plasma Mass Spectrometry (ICP-MS), and Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES). The results revealed significant findings, including the presence of Platinum minerals, minerals rich in aluminum and magnesium, and iron-rich minerals in the analyzed samples in the Santiago River area of Esmeraldas was identified. Another interesting contribution is the presence of all the Rare Earth Elements (REE), predominating values of lanthanum, cerium and neodymium. These findings indicate that economically valuable minerals could be subject to future investigations and exploration. In summary, this research project highlighting the need to address issues related to sustainability and regulation in this sector. Furthermore, the results suggest the potential for discovering new sources of valuable minerals in the area, opening up opportunities for future research in the quest for precious metals and strategic mineral resources.

Keywords: Artisanal Mining, alluvial sands, mineralogical characterization, rare earth elements, metallic mining, sustainable development.