

Geochemical and Spatial Distribution of Minerals in the Tailings of IFE/IJESA Gold Mine Zone, Nigeria

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Abstract : The main objective of this research is to identify the geochemical and mineralogical characteristics potential of unexplored tailings around the gold deposit region using spatial statistics and map modeling. Some physicochemical parameters such as pH, redox potential, electrical conductivity, cation exchange capacity, total organic carbon, total organic matter, residual humidity, Cation exchange capacity, and particle size were determined from both the mine drains and tailing samples using standard methods. The physicochemical parameters of tailings ranges obtained were pH (6.0 - 7.3), Eh (-16 - 95 Mev), EC (49 - 156 μ S/cm), RH (0.20-2.60%), CEC (3.64-6.45 cmol/kg), TOC (3.57-18.62%), TOM (6.15-22.93%). The geochemical oxide composition were identified using Proton Induced X-ray emission and the results indicated that $\text{SiO}_2 > \text{Al}_2\text{O}_3 > \text{Fe}_2\text{O}_3 > \text{TiO}_2 > \text{K}_2\text{O} > \text{MgO} > \text{CaO} > \text{Na}_2\text{O} > \text{P}_2\text{O}_5 > \text{MnO} > \text{Cr}_2\text{O}_3 > \text{SrO} > \text{K}_2\text{O} > \text{P}_2\text{O}_5$. The major mineralogical components in the tailing samples were determined by quantitative X-ray diffraction techniques using the Rietveld method. Geostatistical relationships among the known points were determined using ArcGIS 10.2 software to interpolate mineral concentration with respect to the study area. The Rietveld method gave a general Quartz value of 73.73-92.76%, Ilmenite as 0.38-4.77%, Kaolinite group as 3.19-20.83%, Muscovite as 0.77-11.70% with a trace of other minerals. The high percentage of quartz is an indication of a sandy environment with a loose binding site.

Keywords : tailings, geochemical, mineralogy, spatial

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