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EXTRACTION PROCESS OF CHROMIUM, COBALT AND NICKEL FROM ULTRABASIC SOILS, SABAH

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Abstract: Ranau, Sabah has been chosen as the pilot study area due to widely distributed of ultrabasic soils, rather thickness and good accessibility. A total of area approximately 1.1 square kilometers has been mechanically bored through 3 – 20 meters thick in situ soils. The estimated soil reserve is approximately 19.25 million tonnes. The study of the soil by X-ray diffraction technique (XRD) has shown that the original rock is serpentinite, while the soils contain goethite, FeO(OH); phlogopite, $KMg_3(Si_3Al)O_{10}(OH)_2$; gibbsite, $Al(OH)_3$; rutile, TiO_2; faujasite, $Na_2Al_2Si_4.7O_{13.4}xH_2O$; kaolinite $Al_2Si_2O_5(OH)_4$, and malachite $(Cu_2CO_3(OH)_2$. Due to the low percentage of magnesium in the ultrabasic soils, goethite is believed the major host mineral for Cr, Co and Ni. The elemental distributions were also mapped by electron probe microanalyser (EPMA). Elemental analyses using X-ray fluorescence spectrometry (XRF), atomic absorption spectrometry (AAS) have shown that the ultrabasic soils contain 35 – 45 % Fe, 0.8 – 2.2 % Cr, 0.04 – 0.1 % Co and 0.2 – 1.4 % Ni. A modified atmospheric acid leaching method by batch using ceramic ball mill was developed in the current research to decrease contamination, to match the grinding and leaching steps, and to decrease the processing time. Hydrochloric acid was used in the first step of leaching, followed by extraction by sodium metabisulphate. Solid-liquid separation for the leached materials was done on locally designed stainless steel presser filter. The above mentioned analytical techniques were employed to identify the crystalline phases and the chemical composition and to follow the structural modification occurring upon thermal treatment.