

## **Heavy metals migration through the clayey soil from Telipok, Sabah (Pergerakan logam-logam berat melalui tanah berlempung daripada Telipok, Sabah)**

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The migrations of heavy metals namely Cu, Cr, Ni, Pb and Zn through the soil from weathered rock of the Crocker Formation in Telipok, Sabah were studied by means of leaching test. The leaching test conducted on soil samples shows that most of the heavy metals are retained at the top part of the leaching columns i.e. at the depth of 1.0 cm. All of the heavy metals concentration decreased with the increasing depth within the soil profiles. The leachate analysis indicated that all of the heavy metals except Pb achieved the breakthrough curves at the first 4 pore volume (PV). The breakthrough curve for Pb was achieved after 5 PV of leaching. From this study, based on the breakthrough curves and mass balance calculation, it can be concluded that variation occurs during migration or mobilisation of heavy metals. After leaching 7 PV of solution, the relative concentration ( $C_i/C_o$ ) of Cu, Cr, Ni, Pb and Zn are maintained at 0.90, 0.82, 0.98, 0.94, and 0.80 respectively. The data obtained indicates that Zn has high mobility followed by Cu, Ni, Cr, and Pb. At the end of the leaching test, the

microstructural study showed the occurrence of micro cracks, high pore spaces and the forming of channels at the top part of the columns. Whereas, the bottom part shows tight structure with low pore spaces and low form of channels.

*Perpindahan logam-logam berat iaitu Cu, Cr, Ni, Pb, dan Zn melalui tanah terluluhawa yang berasal daripada batuan Formasi Crocker di Telipok, Sabah telah dikaji melalui ujian larut lesap. Ujian larut lesap yang dijalankan ke atas sampel-sampel tanah menunjukkan logam berat kebanyakannya terperangkap di bahagian atas turus larut lesap iaitu pada kedalaman 1.0 cm. Kesemua logam-berat menunjukkan kepekatan yang berkurangan dengan bertambahnya kedalaman profil. Analisis air larut resapan menandakan bahawa kesemua logam-logam berat mencapai lengkung bulus pada empat isipadu pori yang pertama (4 PV), kecuali Pb. Lengkung bulus Pb dicapai selepas larut lesap 5PV larutan. Setelah larut lesapan 7 PV larutan, kepekatan relatif ( $C/C_0$ ) bagi Cu, Cr, Ni, Pb dan Zn masing-masing adalah dikekalkan pada 0.90, 0.82, 0.98, 0.94, dan 0.80. Daripada kajian ini, disimpulkan bahawa berdasarkan lengkung bulus dan kiraan imbalan jisim didapati bahawa perpindahan atau pergerakan logam-logam berat adalah pelbagai. Data yang diperolehi menandakan bahawa Zn mempunyai pergerakan yang lebih pantas diikuti oleh Cu, Ni, Cr dan Pb. Pada akhir ujian larut lesap, kajian struktur mikro menunjukkan pembentukan retakan mikro, ruang-ruang pori yang besar dan pembentukan alur-alur pada bahagian atas turus. Manakala, bahagian bawah menunjukkan struktur yang padat dengan rendahnya ruang-ruang pori dan sedikit pembentukan alur-alur.*