

13th International Conference on Nuclear Microprobe Technology & Applications 22-27 July 2012, Lisbon, Portugal

Application of PIXE and RBS to quantify the removal of Ni and Pd from polluted waters using skins of cocoa (*Theobroma cacao*) and sweet potatoe (*Ipomoea batatas*)

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The industrial sector is one of the most dynamic sectors of the economy and is of cardinal importance in economic development and poverty alleviation. Furthermore, economies with low levels of industrialisation are gradually shifting dependence from agriculture to the industrial sector, while developed economies, with a high level of industrialisation, are shifting from the industrial to the service sector [1]. Amongst the various industrial sectors, a substantial portion of effluents containing heavy metals are generated by electroplating (nickel, lead, zinc and copper), tanneries (chrome) and other chemical industries.

Many engineering processes have been designed to remove the heavy metals from the polluted parts of the ecosystem. These processes are however highly capital intensive. To establish a less costly means of removal of heavy metal pollution, the dried skins of cocoa (*Theobroma cacao*) and sweet potatoe (*Ipomoea batatas*) were pulverized and used in the absorption of the heavy metals Ni and Pb. After adsorption by the metals, the powders were dried and then pressed into tablets. For quantification of the elemental adsorption, PIXE, using the GeoPIXE computational software, is a versatile multi-element analytical technique, and has minimum detection limits down to concentration ranges as low as 0.1 parts per million [2, 3]. To determine the composition of the major elements such as C, O and N, Backscattering Spectrometry, using SimNRA software, [4] was used. In this study we report on the economic viability of using the skins of cocoa and sweet potato in the removal of Ni and Pd from polluted waters.

[1] Carter et. al. (1993) World Bank Discussion Papers # 224.

[2] Ryan et. al. (1995) NIMB, vol. 104, pp. 157-165.

[3] Guambe et. al. (2012), NIMB, vol. 273, pp. 171-172.

[4] Mayer (1999) Am. Inst. Phys. Conf. Proc., vol. 475, pp. 541-544.