

SPECIATION OF SOME HEAVY METALS IN NGONG RIVER USING THE JOINT EXPERT SPECIATION SYSTEM (JESS)

DAMARIS MBUI¹, DUKE O. ORATA², GRAHAM E. JACKSON³ & DAVID K. KARIUKI⁴

^{1,2,4}Department of Chemistry, University of Nairobi, Kenya

³Department of Chemistry, University of Cape Town, South Africa

ABSTRACT

Ngong River, a tributary of Nairobi River in the Capital City of Nairobi in Kenya, was assessed for heavy metal and their species using atomic absorption spectroscopy (AAS) and the Joint Expert Speciation System (JESS) a computer program for equilibrium calculations. Six sampling points in the middle stream of Ngong River.

Physico-chemical parameters were analysed *insitu* while grab samples were analysed for seven metals and their species were predicted using JESS. The samples had pH values of about 7.5, except for sample no.3 which recorded a pH value of 8.3. Of the seven analyzed ions, the most abundant metal was iron with a concentration of 6.56 mg/L while some of the metals were below the detection limits in some sampling points.

The concentrations of the heavy metals were used to construct a speciation predicting model of the Ngong river using the JESS. Using this model, the major species in most of the samples were predicted to be $[\text{Cr}(\text{OH})_2]^{1+}$, $[\text{Fe}(\text{OH})_2]^{1+}$, $[\text{Zn}_4(\text{OH})_4]^{4+}$, Mn^{2+} , Cd^{2+} , $[\text{Pb}_4(\text{OH})_4]^{4+}$ and $[\text{Cu}_3(\text{OH})_4]^{2+}$ for Chromium, iron, zinc, manganese, cadmium, lead and copper respectively. It is also clear that some ions were found in labile state for example Zn^{2+} , Mn^{2+} , and Cd^{2+} , states that are considered to be more toxic than their combined states, a situation rendering the Ngong river water unsuitable for domestic use.

KEYWORDS: Ngong River, Pollution, Heavy Metal, Speciation, JESS