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DETERMINE ELEMENTS CONCENTRATION IN SOIL USING XRF

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ABSTRACT

In this study, soil samples were taken from the state of AL-Gazeera-Sudan to detect the concentration of minerals in it. The first sample was taken from the surface and the second from a depth of 20 cm.

The samples were first prepared by mixing with wax (3: 1). The mixture then crashed until it became homogenous. The mixture then compressed into a piston and finally the sample was tested using the XRF. The high-concentration elements in the sample were identified by analysis and found to belong to clay minerals (geology) and found high concentration metals such as silicon dioxide - iron oxide (3) - aluminum oxide (2). Some of the elements are very small concentration and some are almost non-concentrated and are associated with the existing samples (Cobalt 4 and Chlorine). No significant concentration of minerals has been obtained and therefore can be classified as agricultural, residential

I. INTRODUCTION

X-ray fluorescence (XRF) spectrometry is an elemental analysis technique with broad application in science and industry. XRF is based on the principle that individual atoms, when excited by an external energy source, emit X-ray photons of a characteristic energy or wavelength. By counting the number of photons of each energy emitted from a sample, the elements present may be identified and quantities. Modern XRF instruments are capable of analyzing solid, liquid, and thin-film samples for both major and trace (ppm-level) components. The analysis is rapid and usually sample preparation is minimal or not required at all. such as paintings and murals[1,2,3].

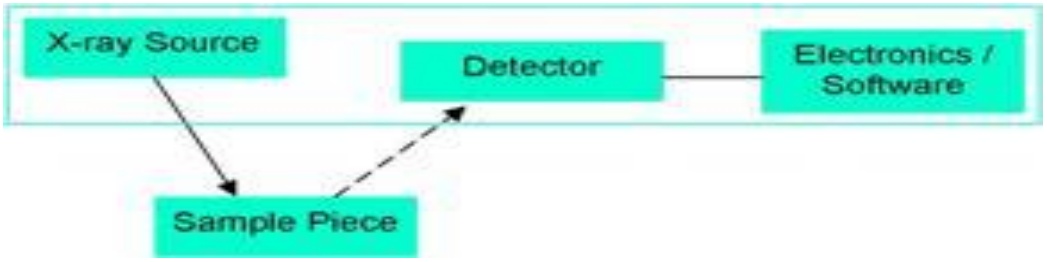
II. EXPERIMENT SETUP

Step One: Sample Preparation

- Samples of soil from surface and depth of 20 cm was collected from Gezira State.
- Each sample (surface/20cm depth) weight was 12 g. Wax weighted 3 g was added the samples with a percentage of (3:1) (soil: wax).
- The mixture was crashed until it became homogenous and then pressed in a pressing machine.

Step Two: XRF Detection

The figure below shows how the samples were detected



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Sample of soil on the surface to the left

Sample of soil 20 cm depth to the right

Apparatus

XRF is a device used to analyze samples by stimulated the atoms inside and determine its consistence's in addition to the computer unite.

The detector of the XRF

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III. RESULTS

Lap No	7413	7414	Unit
Element	Lower	Upper	100%
Na_2O	0.550	0.435	%
MgO	2.809	2.816	%
Al_2O_3	17.160	17.575	%
SiO_2	57.679	57.812	%
P_2O_5	0.161	0.227	%
SO_3	0.043	0.059	%
K_2O	1.225	1.447	%
CaO	6.025	6.380	%
Cr_2O_3	0.362	0.031	%
Co_3O_4	0.016	---	%
TiO_2	2.169	2.190	%
Fe_2O_3	11.348	10.535	%
Rb_2O	0.008	0.007	%
Ga_2O_3	0.004	0.003	%
ZnO	0.013	0.014	%
Cl	0.021	---	%
SrO	0.044	0.043	%
Pbo	0.007	0.012	%
Nio	0.022	0.022	%
Cuo	0.015	0.006	%
ZrO_2	0.053	0.052	%
Y_2O_3	0.005	0.006	%
BaO	0.060	0.056	%
Nb_2O_5	0.006	0.004	%
CeO_2	---	0.053	%

IV. CONCLUSION & DISCUSSION

As the table shows there is very slight difference in the concentration of elements between the surface and the depth. This due to the homogenous soil consistence of Gezira State. The high-concentration elements were identified by analysis and found to belong to metallic minerals based on geology and found high-concentration minerals such as silicon iron oxide (SiO_2) and aluminum oxide (Al_2O_3) .As some elements have been shown in very small percentages , which are almost non-concentrated and are considered to be associated with the existing samples. No concentration of minerals has been obtained, there for; this sample can be classified as agricultural, residential or other soil.

REFERENCES

1. *"X-Rays". NASA. Archived from the original on November 22, 2012. Retrieved November 7, 2012.*
2. *Novelline, Robert (2014). Squire's Fundamentals of Radiology. Harvard University Press. 5th edition. ISBN 0-674-83339-2.*
3. *"X-ray". Oxford English Dictionary (3rd ed.). Oxford University Press. September 2015. (Subscription or UK public library membership required.)*
4. *"Science Diction: How 'X-Ray' Got Its 'X'". 2010-06-18. Retrieved 2014-03-23*