NAA for Trace Elemental Analysis of Sludge Samples from Different Oil Sites in the Egyptian Eastern Desert

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Abstract:

Determination of the radioactive isotopes concentrations in the petroleum waste of sludge and sand is an essential issue not only to refineries, industrial processing, waste disposal and transports but also, to human health and the environment. As these radioactive isotopes are radiation risky, therefore they should be assessed and controlled. Moreover, they might contain heavy and toxic elements which cause hazardous pollution. This paper will focus on the evaluation of the concentrations of metals, heavy and toxic elements in sludge samples from different petroleum companies’ sites located in the eastern Egyptian desert. Five sludge oil samples were elementally analyzed by Neutron Activation Analysis (NAA) technique. The samples were irradiate using the irradiation box inside the Egyptian second research reactor (ETRR-2) (rabbit irradiation system) for 4 hours and then counted after 14 days using HPGe detector. 18 isotopes named (Ca, Sc, Cr, Fe, Co, Zn, Br, Rb, Sr, Ag, Sb, Cs, Ba, Eu, Yb, Lu, Hf, and Ta) were detected with different concentrations in the samples under investigation. The isotopes of Ca, Fe, Sr, and Ba had high concentrations compared with other isotopes in the samples. The toxic element of barium with high concentration and other trace elements with low concentrations were detected in the samples. High concentration of Fe trace elements above the standard level was detected in all samples. The outcomes of the study imply that more monitoring is needed for the petroleum waste in these locations to minimize the environmental pollution and to minimize the radiation risk for the workers.

Keywords:

INAA, Sludge, TE-NORM, Irradiation, Oil trace elements.

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