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A feasibility study: The use of the NaI(Tl) detector for the measurement of U, Th and K in beach sand

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Gamma ray spectrometry is a simple and inexpensive method to determine U, Th and K in geological samples. In routine analysis the detector used is high purity Ge (HPGe) detector. While the high resolution of this detector greatly simplifies the interpretation of the gamma ray spectra, the high initial cost and constant requirement of liquid nitrogen are some disadvantages associated with this detector. The NaI (Tl) detector is another type of a detector that can be used for similar analysis. It has the disadvantage of having a low resolution that result in overlapping of peaks when the sample is a multiple gamma emitter. However, it is a low cost detector having better efficiency and ability to operate at room temperature.

The aim of this study was to determine the feasibility of using the low cost NaI(Tl) detector instead of high cost HPGe detector to analyse of ^{238}U, ^{232}Th and ^{40}K activity concentrations in the beach sand. The three window matrix method which takes into account, the inter element contribution in signature peaks was used in calculating the element concentration. The values obtained were compared with those measured using a HPGe detector and was found to be in agreement for ^{238}U and ^{232}Th. The R^2 values were 0.9956 and 0.9987 respectively. This indicates, that the NaI(Tl) is as good as the HPGe detector for ^{232}Th and ^{238}U analysis. However, for ^{40}K, the values obtained from the two methods were not in agreement.