

Title: Natural radioactivity, mineralogy and hazard assessment of syenogranites (ornamental stones) using a statistical approach

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Abstract: The study focused on syenogranite and its altered variety, and specifically monitored the activities of ^{226}Ra , ^{232}Th , and ^{40}K using NaI(Tl) gamma-ray spectroscopy. Syenogranites in the study area in Egypt were investigated to determine their potential use in industries such as ornamental stones and ceramics. The main outcrops in the study area consist of metasediments, metavolcanics, metagabbro, syn-to late-orogenic granites, and post-orogenic granites (syenogranites). There are also numerous dikes and veins of various shapes and compositions that have intruded and penetrated all the older rocks in the area. The mean activity ($\pm$ standard deviation, SD) of these radioelements in the granites is ^{226}Ra ($63 \pm 71 \text{ Bq kg}^{-1}$), ^{232}Th ($76 \pm 170 \text{ Bq kg}^{-1}$), and ^{40}K ($1248 \pm 532 \text{ Bq kg}^{-1}$) were found to be greater than the world average. The radiological hazards are mostly attributed to the γ -rays emitted by granitic rocks. The granites studied in this study deviate from international standards mainly due to the presence of minerals containing radioelements such as zircon, allanite, monazite, sphene titanite, apatite, thorite, samarskite, fergusonite, xenotime, columbite, apatite and fluorite. As a result, granitic rocks are unsuitable for home building.

Keywords: Granitic rocks, NaI (Tl) detector, Radionuclides, Radiological hazard, Uranophane

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