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Gamma Ray Evaluation of Fast Neutron Irradiated on Topaz from Sri Lanka by HPGe Gamma Ray Spectrometry

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The purpose of this study was to evaluate the radionuclide concentrations of London blue topaz after fast neutron irradiation. The London blue topaz was obtained from Sri Lanka which classified into dark and light colors in the shape of an oval and rectangle with small, medium and large size. The optical property and radionuclide concentrations of London blue topaz have been examined by UV - Visible spectroscopy and HPGe gamma ray spectrometry, respectively. The UV - absorption spectra of topaz were taken in the range of 300 to 800 nm at room temperature. The results showed that the absorption peak of topaz was observed with only broad peaks in the range of 550 to 700 nm and 630 nm that correlated to the O - center in hydroxyl sites which substitutes for fluorine in topaz structure. The radioactivity of dark and light colors in the shape of an oval and rectangle London blue topaz was in the range of 1.437 *plusmn*; 0.014 to 21.551 *plusmn*; 0.037 nCi/g (oval dark), 2.958 *plusmn*; 0.031 to 6.748 *plusmn*; 0.054 nCi/g (oval light) and 2.350 *plusmn*; 0.014 to 43.952 *plusmn*; 0.088 nCi/g (rectangle dark), 1.442 *plusmn*; 0.023 to 6.748 *plusmn*; 0.054 nCi/g (rectangle light), respectively. The decay rates of ^{46}Sc , ^{182}Ta and ^{54}Mn isotopes created by irradiation showed that the time decay of the radioactive element depended on the size of the topaz so increased with decreasing the size of topaz. Moreover, the size of topaz also affects the absorption coefficient. This study is applied to predict the time of residue dose of topaz for enhancement colorless topaz by neutron radiation treatment.

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