

Atitaya Sookkasem 2010: Quantitative Identification of Irradiated Garlic Powder by Thermoluminescence Technique. Master of Science (Applied Radiation and Isotopes), Major Field: Applied Radiation and Isotopes, Department of Applied Radiation and Isotopes. Thesis Advisor: Assistant Professor Wanwisa Sudprasert, Ph.D. 92 pages.

Thermoluminescence (TL) is one of the most popular techniques used for identification of irradiated foods such as spices, herbs and dried fruits in accordance with the Codex Standards. TL analysis is based on the determination of TL of adhering or contaminating minerals in foods. The purpose of this research is to investigate how TL technique can be used to identify irradiated garlics and estimate the actual absorbed dose. The mineral separation procedure recommended by the European Committee for Standardization (CEN) was followed to separate silicate minerals from samples by density separation. X-ray diffraction (XRD) spectroscopy was employed to investigate the type of minerals present in garlic powders. TL of separated minerals were analysed using a Harshaw 4500 TL reader. The results showed that the mineral composition of garlic powders was mainly quartz (SiO_2) of varying amounts depending on the type of garlics. The TL intensity linearly increased with the amount of quartz present in the samples. The accuracy of qualitative analysis based upon TL ratio ($G1/G2$) of two successive glow curve before ($G1$) and after ($G2$) irradiated with a reference absorbed dose of 1 kGy according to the standard method (EN 1788) was examined using garlic powders irradiated with gamma ray at the dose of ranging from 0 to 10 kGy. The result showed that TL ratio was indeed higher than 0.5 for all irradiated samples while that of non-irradiated was less than 0.1. TL technique could correctly identify irradiated samples even after 3 months of ambient storage. The dose-response curves between the absorbed doses and TL signals were determined. The TL signals were considered in terms of TL ratio and first glow intensity. TL ratio increased with the increasing absorbed doses ranging from 0 to 4 kGy, then slightly increases or decreases in TL ratio at 4 to 10 kGy were observed, whereas the $G1$ values increased with the increasing doses from 0 to 10 kGy. Those relationships were found as trinomial functions. Correlation coefficients (R^2) between absorbed doses and $G1$, using a quadratic fit, were higher than those of TL ratios. However, the determination of absorbed dose in blind garlic samples revealed the effectiveness of applying TL ratios for quantitative identification of garlic powder irradiated at the doses of 0 to 4 kGy

Student's signature

Thesis Advisor's signature