

AN ATTEMPT TO USE SWEETENERS AS A MATERIAL FOR ACCIDENT DOSIMETRY

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In case of a radiological accident it is important to determine the exposure to radiation of general population. In this case several materials can be used to reconstruct the exposed dose. Tooth enamel has been studied for a long time and now the procedures to determine the dose are well established for *in vitro* measurements [1]. Although efforts are under way to perform *in vivo* measurements [2], up to now *in vitro* measurements have been the most used approach. An alternative to tooth enamel dosimetry is to investigate materials that are present in the environment that could give information about the exposed dose. Many materials have been investigated by different techniques: sugar, wall bricks, roof tiles, plastics, watch glass, ruby present in watches, medicines carried by persons and shell button. In this work an attempt is made to use sweeteners as a possible accident dosimeter material. Sweeteners are becoming increasingly common and it is more likely to find them in many dwellings.

Sweeteners based on saccharine, cyclamate, stevia and aspartame were used as acquired in the local stores and an aliquot of 100 mg was measured before and after gamma irradiation. ESR spectrum was recorded in a Varian E-4 Spectrometer system, operating at X Band ($\nu \sim 9$ GHz), with modulation amplitude of 0.2 mT, scan range of 10 mT, scan time 1 minute and adequate microwave power and in K-Band ($\nu \sim 24$ GHz) spectrometer for better spectral resolution.

Although the sweeteners have different chemical compositions it was a surprise to find out that the ESR spectra were similar in all of them. A more careful analysis revealed that all sweeteners are not pure materials, as is the case of sucrose or ordinary sugar. In all sweeteners studied lactose is added as an excipient and in some others silicon dioxide is present as an antihumectant. As a result the ESR signal recorded belongs to lactose. This material has already been investigated for ESR dosimetry [3,4] and a low dose level of 1 Gy can be measured using the ESR signal of this material in one of the sweeteners studied.

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References:

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