

# HIGH SENSITIVITY DOSIMETRICAL SYSTEM FOR ENVIRONMENTAL, NATURAL RADIOACTIVITY SURVEY

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The high sensitivity dosimetical system is destined for measuring of the absorbed dose in air which is produced of the X and gamma radiations within the interval 30 keV - 3 MeV.

This system consists in a dosimetical box which has a cylindrical form with the next dimensions:  $\phi = 50$  mm,  $h = 10$  mm, which contains five thermoluminescent detectors type  $\text{CaSO}_4:\text{Dy}$ .

The detectors are tablets with dimensions:  $\phi = 10$  mm and  $h = 0.8$  mm.

The raw materials used for obtaining the thermoluminophor powder are the pure substances:  $\text{CaSO}_4$  u.p.;  $\text{H}_2\text{SO}_4$  e.g. and spectral  $\text{Dy}_2\text{O}_3$ .

The tablets are obtained pressing the thermoluminophor powder and teflon mixture. In this way the thermoluminophore substance is uniformly included in a teflon matrix.

$\text{CaSO}_4:\text{Dy}$  thermoluminescent detectors (TLD), are obtained in our laboratory by the controlled doping of the  $\text{CaSO}_4$  crystal with the activant dysprosium.

The original technology allows obtaining of the thermoluminescent crystals with high sensitivity leaving from very pure substances.

The measurement of the absorbed dose is based on the principle of the thermoluminescence, consisting in the occurrence of excited states in the  $\text{CaSO}_4:\text{Dy}$  crystal during irradiation; when heating, this crystal, following a pre-established thermal cycle, returns to its background state by emitting a fluorescence light whose intensity is proportional with the absorbed dose [1]. We use for reading of the detectors a Victoreen 2800 equipment.

The dosimetric system is exposed to the environmental irradiation for a minimum period of 30 days and is placed at a standard height, 1 m from the soil.

The main dosimetric characteristics of the system are in accordance with the requirements of the International Standards [2].

They are presented in the following:

- the absorbed dose measuring interval has between  $(10^{-5} - 10^{-1})$  Gy; linearity value  $R$  is defined by the ratio between measured dose ( $D$ ) and the conventionally true dose  $\text{EIR} = D/E$ :

a) within the interval  $(10^{-5} - 10^{-4})$  Gy,  $0.5 \leq R \leq 1.5$ ;

b) within the interval  $(10^{-4} - 10^{-1})$  Gy,  $0.75 \leq R \leq 1.25$ ;

- the homogeneity of the lot detectors from dosimeters is  $\varepsilon \leq 30 \%$ ; one lot has 50 detectors;

- the reproductibility of the irradiation during 10 complete cycles: irradiation, reading of the information, regeneration of the detectors for absorbed doses of  $5 \cdot 10^{-5}$  Gy and  $2 \cdot 10^{-4}$  Gy is defined by a standard deviation,  $\sigma \leq \pm 7.5 \%$ ;

- the dependence of the response with the radiations energy on the whole energetic interval is given by a permissible value of R,  $R \leq 2$ .

The high sensitivity dosimetrycal system can be used in environmental for measuring absorbed dose in air, he is not influenced by climatic factors.

We hope as with our dosimeter systems to participate to compare international.

## BIBLIOGRAPHY

[1] D. Serban - Dosimetrie si Radioprotectie.

[2] IEC 1066-1991 - Thermoluminescence dosimetry systems for personal and environmental monitoring.