WIDENING THE RANGE OF APPLICABILITY OF PHOTON RADIATION DETECTORS FOR HIGH-DOSE MEASUREMENTS USING EPR DOSIMETRY METHODS

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At present, wide application of high-power ionizing radiation sources drives the intensive development of high-dose dosimetry. Thermoluminescence dosimetry devices completed with photon radiation detectors, used at RFNC – VNIITF, have limited upper measurement range due to the sensitivity enhancement effect (so-called superlinearity). In particular, the sensitivity of PST detectors based on the aluminophosphate glass, is kept constant only when measuring the bremsstrahlung radiation exposure dose up to 10^5 R, and then sharp, about two–threefold increase in their sensitivity is observed, that limits their range of applicability [1].

The objective of the current work is to widen the range of applicability of PST photon radiation detectors up to the dose range higher than 10⁵ R by using signals of electron paramagnetic resonance from irradiated samples.

In the current work, standard PST thermoluminescence detectors IS-7 based on the aluminophosphate glass were used. The samples were irradiated by doses in the range from 10⁴ to 10⁷ R from ⁶⁰Co gamma-radiation source. Additionally the problems of detector fading and annealing of samples were studied. To measure electron paramagnetic resonance signals, the radiospectrometric analyzer of electron paramagnetic resonance EPRA 9600 was used with the spectrometer unit CMS-8400.

The results of the work have shown that the dose dependence of electron paramagnetic resonance signals from PST thermoluminescent detectors is sublinear up to 10^7 R, indicating the potential of using these detectors for the purposes of high-dose dosimetry.

References

1. **Kortov, V. S.** Status and prospects for the development of thermoluminescence dosimetry [Text] / V. S. Kortov, V. P. Pudov, S. V. Zvonarev // Proceedings of the Conference «Xth inter-industry conference on radiation resistance», October 2012, Sarov. (in Russian).