

Determination of Radioactive Concentration of Tritiated water by EPR spectrometry

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Usually, the radioactivity of tritiated water is measured by Liquid Scintillation Spectrometry. The measurement of radioactivity for tritiated water with high specific activities using LSC implies multiple isotopic dilutions leading to liquid radioactive wastes with medium activities. In present study, a novel method for determination of radioactive concentration in samples of HTO is proposed. The method relies on the determination of free radicals radio-induced by self-irradiation in frozen samples.

The EPR analysis of the HTO samples stored in liquid nitrogen confirmed the accumulation of the hydroxyl radical. The hydrogen radical is not stabilized at the temperature of -196°C . In range of radioactive concentration of 3.7...4500 MBq/ml the correlation between the EPR signal (signal intensity or amplitude for central line with $g\ 2.026$) and the radioactive concentration is linear.

The relative deviation for HTO with radioactive concentration of 45.9 GBq/ml is $\pm 2.6\%$ in case of determination of the signal intensity and $\pm 3.6\%$ for determination of the amplitude of central line.

The obtained results confirm the possibility of the use of EPR spectrometry in determination of radioactive concentration for high activity samples. The detection limit for 24 hours accumulation time is 110 MBq/ml.