# Adaptation of the $^{226}$Ra determination method in water using liquid scintillation spectrometry

## Section: Radiochemistry

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## INTRODUCTION

**Water is the most important pillar of the health. Its content in the adult body amounts to 70%. The quality assessment and delivering water with the appropriate quality are the essential social challenges which affects the health and the life span of the whole population. A determination of the radioactive ingredients is one of elements of the water quality surveys. A particular risk to humans is $^{226}$Ra after intake.**

## AIM OF WORK

**The emanation method was previously used to determine the concentration of this isotope in the Radiation Hygiene Department. However, determination of radium-226 concentration by emanation method is very time consuming. In order to shorten this process, the method of determination of this radionuclide by liquid scintillation spectrometry was adapted. The expected effects of this technique are shortened: preparation and measurement time, in comparison to the emanation method.**

## Quantulus GCT-6220 liquid scintillation counter

## MATERIAL AND METHODS

**After the literature review, a method developed by the International Atomic Energy Agency „A procedure for the Rapid Determination of $^{226}$Ra and $^{228}$Ra in Drinking Water by Liquid Scintillation Counting" was chosen. This methodology was drawn up by an international team of scientists in 2014. Important fact to choose this specific methodology was that people work on establishing the norm: "ISO 22908 Water quality - Radium 226 and Radium 228 - Test method using liquid scintillation counting". This norm is based on methodology, drawn up by IAEA. This method consists on radiochemical separation radium from interfering elements through triple co-precipitation barium sulphate, lead and radium.**

**In 2019 equipment and workstations were organizing for preparation. Some problems were during the development of the methodology. These problems were: poor dissolution of the sediment and separation of the scintillator. As a result, it was impossible to obtain stable samples which would guarantee repeatable results. After a series of preparations, main problems were solved. This was also possible after selecting a suitable scintillator, which guarantee the greatest stability (Opti Phase HiSafe 3).**

**In the first stage of adaptation method only blind samples were prepared and used. Such actions were aimed at preserving the resources of the radium-226 standard and preventing possible radioactive contamination of workplaces or measuring equipment. Only after the methodology was refined, test preparations with the use of radium-226 standard were carried out. For measurements the Quantulus GCT-6220 liquid scintillation counter was used.**

## CONCLUSIUONS

**Thanks to obtaining promising results, it was possible to proceed to the next stages of the methodology. Because the development of this method is advanced and the determination of radium in water is important due to its high radiotoxicity, it is advisable to continue work in the future.**

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