



## **The development of the simultaneous GC method of helium, argon and neon measurements for the groundwater dating.**

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In this work we present a chromatographic method for simultaneous analysis of helium, neon and argon in groundwater from one water sample. The concentration of helium in groundwater may be a good environmental tracer for groundwater dating. Proper use of environmental tracers in hydrogeology for dating purpose, requires the knowledge of recharge temperature of the system and the so-called “Excess air”. “Excess air” allows for the necessary correction of measured concentration of helium in water. Both parameters can be determined by measuring the concentration of argon and neon in groundwater. In the Department of Physicochemistry of Ecosystems from the Institute of Nuclear Physics Polish Academy of Sciences the chromatographic method for the simultaneous analysis of He, Ar and Ne from one groundwater sample for dating purposes was developed. Water samples are taken to the stainless steel vessels with a capacity of 2900 cc. Gases are extracted from water by headspace method (HS). Helium, neon and argon are analyzed on two gas chromatographs equipped with capillary and packed columns and three thermo-conductive detectors (TCD). The chromatographic method was applied to groundwater dating from areas of Podhalańska Basin, Kraków and Żarnowiec. The levels of detection LOD for each measurement systems for the tested compounds are:  $1,9 \cdot 10^{-8}$  cm<sup>3</sup>STP/cm<sup>3</sup> for Ne,  $3,1 \cdot 10^{-6}$  cm<sup>3</sup>STP/cm<sup>3</sup> for Ar and  $1,2 \cdot 10^{-8}$  cm<sup>3</sup>STP/cm<sup>3</sup> for He.

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