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Application of gas chromatographic method in simultaneous measurements of helium, argon and neon concentration in groundwaters

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Helium concentration in groundwater is a fine indicator in water dating in a range from a hundred to tens of thousands of years. Gas chromatography (GC) measurements of helium can be used as an alternative to mass spectrometry (MS) determinations of 4He for groundwater dating [1].

Argon and neon concentrations mainly serve for determining the temperature of recharge and the air excess which is needed to correct measured values of helium concentration [2] .

A chromatographic measurement system of helium, argon and neon concentration in groundwater is presented [3]. Water samples are taken from groundwater with a precise procedure without contamination with air in a special stainless steel vessels of volume equal to 2900 cm3. Helium is extracted from water samples using the head-space method. After enrichment by cryotrap method helium is analyzed in the gas chromatograph equipped with the thermal conductivity detector (TCD) with detection limit of about 2.8 ng He. The helium limit of detection of presented method is 1,2·10-8 cm3STP/gH2O [4].

We are currently working on adapting the method of cryogenic enrichment of helium concentration for simultaneous measurements of the concentration of helium, argon and neon using single sample of groundwater. Neon will be measured with the thermal conductivity detector and capillary column filled with molecular sieve 5A. Argon will be analyzed also with the thermal conductivity detector and packed column filled with molecular sieve 5A.

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