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The analytical methods used in examining resistance of hydrogeological systems to anthropogenic pollution

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In this work the method for evaluating resistance hydrogeological systems to anthropogenic pollution using environmental tracers is described. Resistance groundwater systems to anthropogenic pollution is correlated with the age of water, which can be determined by means of environmental tracers SF6, F-11, F-12 [1] and He. To correct measured values of He and SF6 the temperature of recharge and the excess air is needed and can be determined by measuring Ne and Ar concentrations in groundwater. This paper describes three measurement GC systems to determine the concentrations of greenhouse gases: sulfur hexafluoride (SF6) and chlorofluorocarbons F-11, F-12 [2], the noble gases neon (Ne), argon (Ar) [3] and helium (He) [4] in groundwater. The first system for measurements of the concentration of SF6, F-11 and F-12 consists of a gas chromatograph, type N504 is supplied with nitrogen carrier gas with a purity of 6.0. It is equipped with two packed columns K1 and K2 running at 60°C with the use of the "back-flush" column switching and electron capture detector (ECD) operating at 300°C. Second system for measuring the concentration of the noble gases argon and neon, is composed of a dual Shimadzu gas chromatograph. It is equipped with two columns K4 and K5 operating at 30°C, thermalconductivity detector (TCD) for analysis of argon and helium detector with pulse discharge (PDHID) for analysis of neon. This chromatograph is powered by helium carrier gas 6.0. The third system measures the concentration of helium, consists of a gas chromatograph equipped with a TCD detector and three packed columns filled with molecular sieve type 5A and activated carbon. The carrier gas in this system is argon 6.0.
Detection limit, LOD for each measurement systems for the tested compounds are:
0,06 fmol/L for SF6, 15 fmol/L for F-11, 10 fmol/L for F-12, 1,9•10-8 cm3STP/cm3 for Ne, 3,1•10-6 cm3STP/cm3 for Ar and 1,2•10-8cm3STP/gH_2O for He.

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