

Radium transfer from solid into liquid phase – a theoretical approach to its behaviour in aquifers.

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In the paper, a theoretical approach to the problem of radium presence in mineralized mine water, is presented. Two main types of radium-bearing waters have been found in Polish coal mines. In type A waters, radium isotopes are present together with barium, while concentrations of sulphate ions are very low. Additionally, in these waters a ratio of ^{226}Ra : ^{228}Ra activity is usually higher than 1. In type B waters, no barium can be found, but radium together with sulphate ions. Contrary, in such waters the isotopic ratio of radium ^{226}Ra : ^{228}Ra is below 1, and activities of both isotopes of radium are lower as in type A waters. No other differences in chemical composition of mine waters have been observed.

Analysis shows, that the activity ratio of radium isotopes is related to the dynamics of radium adsorption on the grains of solid phase in the aquifer. During analysis must be taken into account, that the radium build up in formation water due to recoil effect, is stable in time. Additionally, no correlation with elevated concentrations of uranium and thorium in rocks, have been observed. Therefore the enhanced radium content in formation waters must be caused by its mineralization.

The relatively short half life of ^{228}Ra (6 years) shows, that the process of radium transfer from solid into liquid phase is a short term process for geological scale. Therefore radium content in mine waters must be related to the concentration of natural radionuclides in the close vicinity of the aquifer or the water reservoir.