

Abstract

POTENTIALLY MEDICINAL RADON WATERS OF THE FORE-SUDETIC BLOCK

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Radon (^{222}Rn) present in groundwaters can give them medicinal character. Most of the research into the occurrence of this isotope in groundwaters in Poland has focused on the area of the Sudetes so far. This doctoral dissertation is a response to the lack of comprehensive studies on the occurrence of this radioactive gas in groundwaters in the Fore-Sudetic block (FSB) and it aims to prove that it is possible to designate areas with potentially medicinal radon waters in this geological unit.

To achieve this aim, the author analysed the results of 418 measurements of ^{222}Rn activity concentration in the FSB groundwaters. 26 groundwater occurrences characterized by ^{222}Rn activity concentrations of at least 74 Bq/dm^3 were selected as being potentially medicinal radon waters. Most of them are found within the granitoid Strzegom-Sobótka massif. Plotting these points on a map enabled designating three areas with the occurrence of potentially medicinal radon waters. One of them lies within the western part of the granitoid Strzegom-Sobótka massif, another – in the eastern part of the same massif (the Ślęza massif), and the third one is a part of the granitoid Strzelin massif.

Outside these areas, the author also identified isolated occurrences of groundwaters of this type. They are located in the villages Mikołajowice, Wierzchowice, Wiśniowa, Wiry, Ożary, and Łąka. They also hint at the areas where more detailed investigations into the occurrence of ^{222}Rn in groundwaters should be undertaken in the future.

The highest value of ^{222}Rn activity concentration was recorded in a groundwater intake in Wierzchowice, a village situated in the gneiss area of Wądroże Wielkie. This value reached $818 \pm 10 \text{ Bq/dm}^3$.

The lithological and tectonic analysis of the areas with occurrences of potentially medicinal radon waters in the FSB has revealed that these waters are related chiefly to the presence of granitoids and orthogneisses in the bedrock. Increased concentrations of ^{222}Rn in groundwaters are recorded notably in the areas where crystalline rocks occur on the surface in the form of outcrops, and they are also strongly weathered and/or tectonically deformed.

The author observed a medium-strength positive correlation between ^{222}Rn activity concentration and the specific electrolytic conductivity (SEC) of potentially medicinal radon waters. Thus, these waters will be characterised by a relatively long flow time through the rock medium and an increased amount of total mineralisation (TDS).

The ranges of the hydrogeochemical background of ^{222}Rn calculated for selected geological units building the FSB are mostly identical with the range of the regional background of ^{222}Rn in the Fore-Sudetic block. It is only in the Strzegom-Sobótka granitoid massif where the upper value of its background was found to surpass the upper value of the FSB background. This means that potentially medicinal waters will be common within this massif and anomalous in the other geological units.

In the future, the occurrences of potentially medicinal radon waters identified by the author may be used as medicinal waters and the villages where they occur might obtain the status of health resorts.

