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Hydrogeochemical characteristics of mineral and thermal waters

title: **Mineral waters in the southern part of the Upper Silesian Coal Basin (Poland) and the possibility of using the mine waters from abandoned coal mines for therapeutic purposes**

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ABSTRACT

Some groundwaters from the Miocene (Badenian), the Carboniferous and the Devonian formations in the southern part of the Upper Silesian Coal Basin in Poland are used as mineral waters. The paper presents pharmacodynamic coefficients of the brines from the Korona well in Zabłocie and in Ustroń and of the mine waters from the abandoned coal mines “Żory” and “Rymer” in the southern part of the Upper Silesian Coal Basin, which show the possibility to be utilized in medical therapy.

INTRODUCTION

Groundwaters of the Upper Silesian Coal Basin (USCB) is characterised by different chemical composition, e.g. their mineralization degree ranges from several hundred mg/dm³ to more than 200 g/dm³ (Rózkowski et al., 2004; Pluta, 2005). Some of them have been used for hydrotherapeutic purposes since the XIX century. This concerns several mineral waters that are taken from the Miocene (Badenian), the Carboniferous and the Devonian formations, located in the southern part of the USCB (Paczyński, Płochniewski, 1996).

It is also possible to use the mine waters from the Carboniferous formations of the USCB for therapeutic purposes. Studies of the pharmacodynamic coefficients of mine waters from the abandoned coal mines have been performed in order to evaluate the possibility of their use in medical therapy.

MINERAL WATERS IN THE SOUTHERN PART OF THE USCB

The mineral waters from the wells in Zabłocie and Ustroń are characterised by the pharmacodynamic coefficients in compliance with the Polish law. Selected these coefficients in mineral water from the “Korona” well in Zabłocie in the period 1950–2010 are presented in Table 1. Concentrations of iodides and iron ion (II) and values of the mineralization have been almost constant during more than last sixty years.

Table 1. The pharmacodynamic coefficients in mineral water from the Korona well in Zabłocie in 1950–2010.

Pharmacodynamic coefficient	Korona well					
	1950–1975	1976	2001	2007	2008	2010
Mineralization [g/dm ³]	42.2–44.2	43.4	43.1	46.5	46.4	41.0
Fe ²⁺ [mg/dm ³]	8.6–59.5	15.8	14.9	10.5	14.0	12.8
F ⁻ [mg/dm ³]				1.8		2.1
I ⁻ [mg/dm ³]	121.0–140.7	128.7	130.0	134.0	138.0	126.0

MINE WATERS FROM ABANDONED COAL MINES IN THE SOUTHERN PART OF THE USCB

In the USCB in Poland many coal mines have been closed during the last twenty years. In the southern part of USCB “1 Maja”, “Morcinek”, “Moszczenica”, “Rymer” and “Żory” coal mines have been abandoned. Selected pharmacodynamic coefficients in the mine water flowing from the abandoned “Żory” coal mine in the period 1997–2010 are presented in Table 2. Results of the iodide and iron ion (II) and the mineralization are in quantities exceeding the values of mineral waters therefore can be used for hydrotherapeutics.

Table 2. The pharmacodynamic coefficients in the mine water from the abandoned "Żory" coal mine in 1997–2010.

Pharmacodynamic coefficient	Mine water from the abandoned "Żory" coal mine					
	1997–1998	1999	2000	2001–2002	2002–2008	2010
Mineralization [g/dm ³]	71.0–74.2	75.8–85.5	87.1–93.6	95.2–106.5	101.3–109.7	101.8
Fe ²⁺ [mg/dm ³]			40–60			37.2
F ⁻ [mg/dm ³]				1.1		1.3
I ⁻ [mg/dm ³]			20–57			18.2

CONCLUSIONS

Some groundwaters from the Miocene (Badenian), the Carboniferous and Devonian formations in the southern part of the USCB are used as the mineral waters. Studies show that mine waters flowing from the abandoned coal mines, in this region, have mineralization and the iron (II) ion and iodides concentration as required to classified as therapeutic waters.

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