

XXXVIII IAH Congress

Groundwater Quality Sustainability
Krakow, 12–17 September 2010

Extended Abstracts

Editors:
Andrzej Zuber
Jarosław Kania
Ewa Kmiecik



University
of Silesia
Press 2010

abstract id: **453**

topic: **4**
Mineral and thermal water

4.3
Hydrogeochemical characteristics of mineral and thermal waters

title: **Variability of major parameters of water from the Main Spring (Zdrój Główny) in Krynica Zdrój**

author(s): **Lucyna Rajchel**
AGH University of Science and Technology, Faculty of Geology, Geophysics and Environmental Protection, Department of Economic and Mining Geology, Poland, rajchel@geol.agh.edu.pl

Jacek Rajchel
AGH University of Science and Technology, Faculty of Geology, Geophysics and Environmental Protection, Department of General Geology, Environmental Protection and Geotourism, Poland, jrajchel@geol.agh.edu.pl

Edyta Mardaus-Konicka
Uzdrowisko Krynica-Żegiestów S.A., Uzdrowiskowy Zakład Górniczy, Poland, edytka.mk@wp.pl

keywords: Krynica Zdrój, Zdrój Główny spring, carbonated waters

Krynica is one of the Carpathian spas located in the south-eastern part of the Beskid Sądecki Mts at the altitude 560–620 m a.s.l. in the valley of the Kryniczanka stream and in the valleys of its tributaries: the Palenica and the Czarny streams. The resort is situated within the tectonic Magura Unit, at the border of two subunits that differ in their facies development. These are the Sącz zone and the Krynica zone divided by an elongated tectonic discontinuity known as the Krynica dislocation. The area is built of flysch strata: sandstones, shales and marls. The history of Krynica is inseparably associated with the Main Spring (*Zdrój Główny*), which was examined and whose water was analysed for the first time in 1796 by Baltazar Hacquet, a professor of the Lwów University. Next water analyses were carried out in 1807 by I. Schultes, in 1857 by E Czarniański and A. Aleksandrowicz, in 1905 by K. Marchlewski, in 1933 by S. Jurkowski and in 1944 by B. Wagner (Aleksandrowicz, 1858; Dominikiewicz, 1951). A continuous monitoring of the spring began in 1962.

The Main Spring is a natural spring known from the 15th century, flowing from the terrace of the left bank of the Kryniczanka stream at the feet of Parkowa Hill. It is a fracture, ascending spring, flowing into Quaternary strata from the underlying sandstone-shale series belonging to the Paleogenian Maszkowice Member of the Magura Formation at its contact with the shale-sandstone series of the Mniszek Shale Member. The spring intake was first constructed of a timbering made of unknown wood, replaced later by a larch wood timbering, whereas a granite, dish-shaped stonework was made in 1858 (Skórczewski, 1906). The current intake is a bell-like construction; its concrete stonework in the form of a bowl is lined with ceramic tiles and overbuilt with a conical cupola. Part of the spring water is piped into the Major Pipe Room (*Pijalnia Główna*) and used in crenotherapy, while most of the water flows gravitationally to the tank in the Old Bathroom House (*Stare Łazienki*) and is used for bottling of the natural drinking water with the trade name „Kryniczanka”.

The analysis of the major water parameters: mineralization (TDS) and the contents of CO_2 , Ca^{2+} , Mg^{2+} and HCO_3^- , was based on the results of 40 physical and chemical determinations carried out between 1796 and 2005 (Fig. 1).

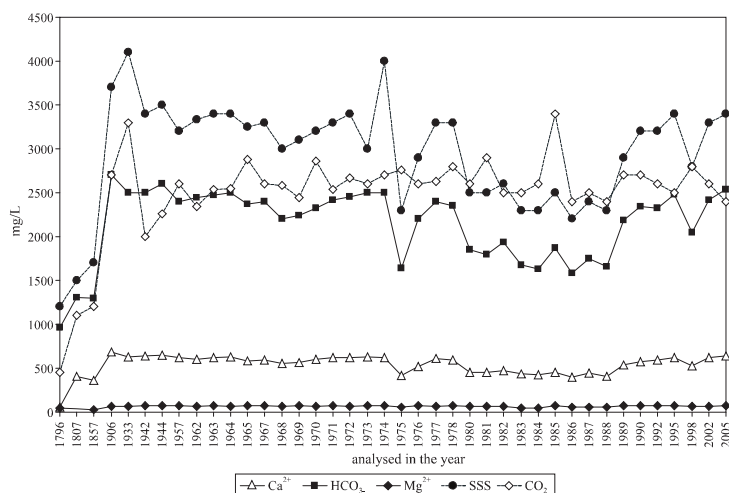


Figure 1. Variability of major parameters of water from the Main Spring (*Zdrój Główny*) in Krynica Zdrój (determined from a database assembled at the Chair of Economic and Mining Geology, AGH).

The first chemical analyses, as made at that time, should be considered accurate. Although their results differ from those of the current ones, it must be stressed that it was at the end of the 18th century when Hacquet (1796) gave the first scientific description of the Krynica water properties and determined them as carbonated waters.

The therapeutic water of the Main Spring is a mineral carbonated water with the content of CO₂ from 2386 to 3448 mg/dm³, whereas its hydrochemical type is HCO₃-Ca, Fe. Mineralization (TDS) varies between 3403 and 2166 mg/dm³. The contents of the following ions in mg/dm³ are: Ca²⁺ 630–399; Mg²⁺ 78–48; HCO₃⁻ 2501–1580; Fe²⁺ 24–3.1; Na⁺ 106–40; Cl⁻ 13.3–5.2 and SO₄²⁻ 41–1.5. Mutual % molar ratios of individual, characteristic components remain stable.

ACKNOWLEDGEMENTS

This research has been supported by AGH University of Science and Technology, Kraków, grant no. 11.11.140.890 & 11.11.140.447.

REFERENCES

Aleksandrowicz A., 1858: *Rozbiór chemiczny wody lekarskiej krynickiej Zdroju Głównego (Chemical analysis of the medicinal Krynica water of the Zdrój Główny)*. Kraków.

Dominikiewicz M., 1951: *Wody mineralne Polski (Mineral waters of Poland)*. PZWL, Warszawa, 1–620.

Hacquet B., 1796: *Neueste physikalisch-politiche Reisen in den Jahren 1794 und 95 durch die Dacischen und Sarmatischen oder Nordlichen Karpathen*. Vierter Theil. Nürnberg.

Skórczewski B., 1906: *Historia Krynicy (The history of Krynica)*. Przegląd Zdrojowy, 3–12.



International Association of Hydrogeologists



AGH University of Science and Technology

2-vol. set + CD
ISSN 0208-6336
ISBN 978-83-226-1979-0