



## Natural mineral waters in Rogaška Slatina

Mineral water springs in Rogaška Slatina were first mentioned in the 12<sup>th</sup> century. By the 19<sup>th</sup> century, this mineral water had achieved the reputation of being the most bottled and sold mineral water in the world. Due to its preciousness and aggressive competition between many vendors, a protection area for these springs was declared already in 1876. It was designed to prevent uncontrolled capture and disruption of the outflow of natural spring water through shallow dug wells. The delineated mineral water spring area covers Rogaška Slatina, Zgornji and Spodnji Gabernik, and Zgornja and Spodnja Kostrivnica in Slovenia. Several springs were supplemented by more than 40 drilled wells after 1952. Only a few produce natural mineral water nowadays. Mineral springs are connected in two interpretative trails: Med izviri Rogaške Slatine (Among Springs of Rogaška Slatina) and Turistična vodna pot Kostrivnica (Tourist Water trail Kostrivnica)

### Anomalies

In the beginning of the 19<sup>th</sup> century, a magnificent building was erected above the main spring at those times – a temple which also gave the name to the spring and brand Tempel. This water had up to four grams of total dissolved solids per litre. More mineralised water from the Styria spring was first tapped in 1884. Both waters were produced from shallow captures. Large-scale excavation for the health spa park in 1908 resulted in the capture of a new spring named Donat. At 11 g/l this water had the highest mineralisation of all. In 1976, the symbol for magnesium was added to the name as this water has the highest content among all the natural mineral waters in the European Union. Donat Mg brand is a Mg-Na-HCO<sub>3</sub>-SO<sub>4</sub> water with high concentrations of magnesium (1,017 mg/l), sulphate (2,200 mg/l) and bicarbonate (7,700 mg/l) ions. The water–gas ratio is 1:20. Donat Mg is produced from up to 600 m deep wells in Podplat and Rogaška Slatina. Due to a restricted recharge and low yield of the aquifer only up to half a litre of natural mineral water flows out of each of these wells. The wells are artesian – no pumps are needed due to gas lift.

Groundwater is of meteoric origin and is recharged through the carbonate rocks of the Boč Mts. It flows very slowly, several thousands of years, and it is produced from the Lower Oligocene (34-28 Mya) andesitic tuf and andesite of the Smrekovec Formation. This aquifer is cut by the Donat Fault in the north and the Šoštanj Fault in the south. Prevailing geochemical processes in water are dissolution of carbonates and evaporites in them which is enhanced by a strong inflow of geogenic CO<sub>2</sub>. The gas is very pure as >98.84 vol% of dissolved gas and >95.23 vol% of separated gas is CO<sub>2</sub>. The gas is emitted from the Earth's mantle to the surface along the Šoštanj Fault and results in a unique noble gas composition of the mineral water. It has extremely high <sup>3</sup>He/<sup>4</sup>He



isotope ratios in comparison to European mineral waters and even worldwide because here 73-97% of helium originates from the subcontinental lithospheric mantle (SCLM).



Fig. 1. Left: Degassing unit at the artesian well V-3/66-70 in Podplat. Right: This mineral water has very high scaling potential. When CO<sub>2</sub> is degassed at the surface, carbonate minerals (e.g. aragonite) precipitate in pipes, so they have to be periodically cleaned and/or replaced.



Fig. 2. Left: Mineral water from a 24 m deep well Kraljevi vrelec is enriched in iron and free gases. Right: Artesian well K-2/75 in Spodnja Kostrivnica which is not exploited.

## References

Nosan, A. 1973: Thermal and Mineral Springs of Slovenia. *Geologija*, 16:5-81. <http://www.geologija-revija.si/dokument.aspx?id=241>

Rman, N., Szócs, T., Palcsu, L., Lapanje, A. 2020: Origin of high mineralized and CO<sub>2</sub> rich magnesium-sodium-bicarbonate-sulphate type mineral water from volcanoclastic andesitic aquifer in Rogaška Slatina, Slovenia. *Environmental Geochemistry and Health* (in review).



---

Trček, B., Leis, A. 2017: Overview of isotopic investigations of groundwaters in a fractured aquifer system near Rogaška Slatina, Slovenia. *Geologija*, 60 (1), 49-60. <http://www.geologija-revija.si/dokument.aspx?id=1298>

The Tourist Water path Kostrivnica. [http://www.rogaska-tourism.com/en/810/The\\_Tourist\\_Water\\_path\\_Kostrivnica.aspx](http://www.rogaska-tourism.com/en/810/The_Tourist_Water_path_Kostrivnica.aspx)

Donat Mg. <http://www.donatmg.eu/en/properties>

Cite this source

Rman, N., Lapanje, A. 2021: Natural mineral waters in Rogaška Slatina – Fact sheet for project GeoConnect3d. Geological Survey of Slovenia, Ljubljana.

Date

13.4.2021