



DOCTORAL THESIS (abstract)

Assessment of the curative potential of thermal water from the Bańska Niżna

Author: **Anna Jagustyn, MSc**

Supervisor: prof. dr hab. Ewa Kmiecik

The study aimed was to assess the curative potential of thermal water exploited by PEC Geotermia Podhalańska S.A in Bańska Niżna. The area selected has allowed for systematic, long-term research, carried out in various exploiting conditions.

As the first step of the research Polish and European legal regulations concerning thermal and curative waters were analyzed. The research program included the measurement of unstable parameters in the field and laboratory analyses of main components, metasilicic acid, fluorides, iodides, iron, sulphur compounds (II), radon isotope and hazardous components.

Experiments verifying the fitness of the methods used by laboratories for the analysis of the concentrations of potentially specific components in thermal waters were planned and carried out. All the obtained results were additionally verified by detailed statistical analysis using the PS IMAGO PRO package by Predictive Solutions, with an analytical engine based on IBM SPSS Statistics v.26.

In the next steps, the stability of the concentrations over time of the main, potentially specific and hazardous components was assessed. The author used the method of control cards for individual measurements and the trend analysis performed with the GWSDAT program. The correlations between the concentrations of described chemical components and the exploitation parameters of each geothermal well were also investigated.

The hydrogeochemical modelling was performed, under which the saturation state of the solution in relation to the individual mineral phases of the reservoir rocks was assessed. The speciation of the main ions determining the hydrogeochemical type and the speciation of potentially specific components for the thermal water collected from all three geothermal wells were analysed. Modelling was carried out using the PHREEQC Interactive v. 3.5.0 program.

At the last step of the study, the potential curative character of thermal water in Bańska Niżna was assessed. The assessment was performed analysing in detail the concentrations of all potentially specific and hazardous components, using deterministic and probabilistic methods.

During the research, the following theses were proved:

- the analysed water are characterized by a stable chemical composition in terms of the main, specific components and the forms of their occurrence in the solution, regardless of the exploitation parameters
- lithological formation of reservoir rocks determines the presence of specific components in the analysed thermal water
- thermal water in Bańska Nižna contain specific components that give them a curative potential

This thesis is a compendium of knowledge in the field of thermal water monitoring - from the stage of planning experiments, through the analysis of legal regulations, the development of sampling and laboratory analysis methodology (including the validation of the methods), to statistical analyses and reliable, objective evaluation of the obtained results.