# Self-purification of ambient air in the underground Bochnia Salt Mine, Poland

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The mineral and chemical composition of the aerosol in the 13th century, underground Bochnia Salt Mine in Poland (UNESCO World Heritage Site) has a significant therapeutic potential for subterraneotherapy and preventive healthcare. The air in this mine is pumped down from the surface through a ventilation shaft. Since the air pollution in this area of Poland fequently exceeds the air quality standards the goal of this study is quantification of natural processes of purification in the path of the air flow based on systematic study of the size distribution, phase composition and chemical composition of suspended particulate matter (PM).

Size-selected aerosol from the Bochnia Salt Mine was collected during a summer and winter period using personal air samplers and deposition tubes. Additionally, the accumulations of dust in the underground excavations were sampled. The aerosol concentration was determined using the gravimetric method by filter weighing on a microscale. The PM was characterised using electron microscopy with microanalysis (SEM/EDS), powder X-ray diffraction (XRD) and micro-Raman spectroscopy.

At all sampled locations, natural components of the aerosol coming from the salt deposit have been identified: nanocrystals of halite, anhydrite and clays. This results from the weathering and all the activity in the mine. The presence of particulate air pollutants entering the mine from the outside air was detected particularly in the vicinity of the ventilation shaft pumping the air from the surface. In the summer season, the main pollutants are pollen, and in the winter season the soot particles from the coal combustion processes. Along with the distance from the downcast shaft, the size and amount of these particles quickly decreases. The temperature and humidity gradient at the entrance, and the air path through the underground tunnels, cause rapid precipitation of the solid particles resulting in significant purification of the air. Therefore, the pure air containing salt aerosol in salt chambers can promote therapies profiled for allergologic and pneumologic aliments.

*This project is supported by Polish MNiSW grant No. 30/DW/2017/01/1.*