Characteristic of technogenic magnetic particles as carriers of potentially toxic elements in long-range and local transport emissions on example of the Izery Mountains

The basic scientific objective of the project is application of natural indicators as snow and mosses, to assessment of seasonal pollution by means elements in industrial area called „Black Triangle Region". The evaluation of pollution will be done on assumption, that air derived particles comprise technogenic magnetic particles (TMPs) as well as potentially toxic elements (PTEs) and their specific feature allow for discrimination between long-range and local sources. Study of research is located in borderland of Poland, Germany and The Czech Republic in area of lignite mining and power industry. The research will be conducted in south-western part of Poland and will be located at the „Hala Izerska", „Granicznik Hill" in the Izery Mountains (Western Sudetes) as well as „Szklarska Poręba". The study site are characterized by high pollution with, *inter alia*, fly ash and dust due to a human activities (industry). This region contributes significantly to the general directions of the long-range transport of atmospheric pollutants in Central Europe delivered from lignite power plants in Poland, Germany, as well as the Czech Republic.

The objective of the project will be based on specific magnetic parameters (*inter alia*, magnetic susceptibility – it is a physical quantity describing the ability of a given substance to be magnetized in the presence of an external magnetic field) and geochemical (determination of PTEs concentration: As, Cd, Cu, Fe, In, Mn, Mo, Ni, Pb, Sb, Sc, Se and Zn) characteristics for dust pollutants and fly ashes accumulated in snow and moss, in two seasons.

A snow samples will be used as an indicator in autumn-winter season, while moss samples throughout the year in both, spring-summer and autumn-winter seasons at cycles. In order to collect a snow samples, the diamagnetic boxes (i.e. plastic barrels) will be used. Special installations (with plastic barrels) will be set at least 1 m above the surface and properly marked and protected from accidentally damage by people or animals. Snow samples will be collected from November to April at 6 exposure cycles (single cycle will not exceed 30 days). Whereas, the moss bags will be used throughout the year in both spring-summer and autumn-winter seasons at cycles. The planned exposure period (in single cycle) will not exceed 60 days and involve 3 moss bags at each sampling site during the duration of exposure. As in the case of diamagnetic barrels, a moss bags and snow barrels will be localised at three sites and after the each cycle the moss bags will be replaced by a new one and transported to laboratory, where will be prepared for detailed magnetic and geochemical analyses.

Magnetic monitoring is a useful tool for a preliminary assessment of pollution by dust and fly ashes on industrial areas. Commonly used technique for assessment and analyses of dust pollutants is sampling of dust filters. However, this method require expensive and sophisticated equipment evenly distributed on area of study. Reasonable alternative for traditional technics can be application of natural indicators that feature minimum maintenance costs and long period of exposition on pollutants up to a few weeks.

The main reason for undertaking the project subject matter is the character and nature of the „Black Triangle Region", which has been related with the mining and industrial activities for many years. It is a well-documented fact that many elements are emitted to the atmosphere in, *inter alia*, combustion or high-temperature technological processes and are accompanied by anthropogenic iron minerals. Magnetic susceptibility can be used as an indicator of the accumulation level of elements in study materials (snow and moss) because of their relationship with theses minerals, which are TMPs and are very often significantly different from the magnetic minerals produced by natural processes because of morphology, stoichiometry and crystallographic structure.

The research results will help to better understand and interpret the results obtained in the areas that are under the strong anthropopressure influence (in this specific case – seasonal level of atmospheric pollution). Moreover, the obtained results will have a significant influence on the environmental research as they will indicate the application of a new, integrated and effective tool. The method is based on the magnetic and geochemical analyses as well as a quantification parameters of anthropogenic pollution. It is used to determine the anthropopressure influence resulting from a long-range and local transports of atmospheric pollutants and to evaluation of environmental contamination at seasonally level.

To conclude, the conducted research will be important for the following scientific fields: environmental engineering and technology, geophysics as well as geochemistry.