



The study of indoor air pollution by means of magnetometry

M. Jelenska, B. Górka-Kostrubiec, and E. Król

Institute of Geophysics, Paleomagnetic laboratory, Warsaw, Poland (bogna@igf.edu.pl, +4822 6915915)

The aim of this study is to establish what kind of outside pollution penetrate into indoor spaces. Here we report preliminary results of magnetic monitoring study of indoor air pollution by particulate matter (PM) measured inside flats and houses placed in different locations in Warsaw area. Indoor air pollution level was evaluated by measuring magnetic properties of dust taken from vacuum cleaners used in private flats. The dust samples were taken from about 180 locations in Warsaw distributed in such polluted places as city centre or communication lines with heavy traffic and in unpolluted suburb places. The locations were also distributed according to height above ground level. There were taken in flats situated from first to 16th floors. The basic magnetic parameters such as χ mass magnetic susceptibility, hysteresis loop parameters: coercive force (H_c), coercivity of remanence (H_{cr}), saturation magnetization (M_s) and saturation remanent magnetization (M_{rs} or SIRM) and χ_{fd} frequency dependence of susceptibility, have been used to identify indoor pollution level and to characterize domain state and granulometry of magnetic minerals. Identification of magnetic minerals have been made by measuring decay curve of SIRM during heating to temperature of 700 °C. For chosen samples concentration of 20 elements were measured.

The most frequent values of susceptibility of dust are between 50 and 150 10^{-8} m³/kg with the maximum around 100 10^{-8} m³/kg. Thermomagnetic analysis for dust differs from that for soil samples taken in the vicinity. SIRM(T) curves for dust show remanence loss at 320 °C and at 520- 540 °C. This is diagnostic for pyrrhotite and magnetite as dominant magnetic minerals. Some samples demonstrate loss of remanence at 160 °C and at temperature characteristic for magnetite. Soil samples do not show pyrrhotite presence or loss of remanence at 160 °C. Display of hysteresis parameters on Day-Dunlop plot indicates predominance of SD/MD grains with various contribution of MD grains. XARM/SIRM indicates the dominant size of particles between 0.03 and 0.1 μ m.

Concentration of 20 elements demonstrate linear correlation with X, ARM, SIRM and M_s values with the best correlation between concentration of heavy metals and M_s . As the results of the study several rules of spatial and seasonal distribution of pollution inside the city were established. The finest particles were found in dust from the highest floor and from the places lying the most away from the source of pollution. High contamination level is found not only for places exposed to heavy traffic but also in rural area with frequent use of coal for home heating.