

## **Particulate matter emitted from the coal fired power plant**

MAREK MICHALIK<sup>1\*</sup>, WANDA WILCZYNSKA-MICHALIK<sup>2</sup>,  
JANUSZ DANKO<sup>3</sup>

<sup>1</sup>Institute of Geological Sciences, Jagiellonian University,  
Poland

<sup>2</sup> Institute of Geography, Pedagogical University of Cracow,  
Poland

<sup>3</sup> EDF Poland Branch no.1 Cracow

\*marek.michalik@uj.edu.pl

High particulate matter (PM) concentration in the air in Poland is a problem of great concern. Even though the amount of fly ash emitted during fuel burning processes in power plants decreases in Poland systematically, its contribution is still significant (27 900 t of fly ash in 2015). Although the composition and properties of fly ash collected during cleaning of flue gas are relatively well known, characteristics of material emitted is only fragmentary. Fly ash emitted from medium size coal fired power plant equipped in pulverized fuel boilers was studied.

The content of amorphous material in PM is higher than in typical clay ash collected on filters in power plants operating pulverized fuel boilers. The content of several trace elements is high: Cr – 3100 ppm; Zn – 1440 ppm; Ni – 939 ppm; Cu – 458 ppm; Pb – 262 ppm; As – 49 ppm; Hg – 1,3 ppm what results in the relatively high annual emission (e.g. for Cr -310 kg/y). Enrichment factor (content of element X in PM vs. clark value for element X in coal ash) is high for several elements: Cr - 25.9; Zn – 8.5; Ni – 9.4; Cu – 4.2; Pb – 4.8; As – 1.1; Hg – 1.5.

The collected PM is heterogenous. It contains numerous spherical particles ranging in size from below 1  $\mu\text{m}$  to more than 10  $\mu\text{m}$ . Single bigger particles are noted (e.g., spherules up to 100  $\mu\text{m}$  in diameter). Content of Si and Al is variable (Si/Al ratio from 0.7 to 8.0). P content is usually not higher than 5 wt% but particles rich in P are also present. Higher content of P correlates with Ca. The surface of spherical particles is covered by irregular forms of Ca sulphate. Char particles present in PM vary in size (up to 100  $\mu\text{m}$ ) and shape and often contain aluminosilicate spherical particles. Content of water soluble fraction is around 10 wt%. Dry residue is dominated by Ca sulphate but also K and Na sulphates occur.

Because of variation in particles size it may be assumed that PM emitted from power plants could be dispersed over broad range. Taking into account a high content of soluble components and domination of very small particles environmental impact seems to be high.