



Peculiarities of mercury distribution in South African coals

Mpho Mathebula

Tshwane University of Technology

M. Mathebula¹, N. Panichev¹, K. Mandiwana¹, N. Mashyanov^{2,3}, S. Pogarev³

¹ Tshwane University of Technology, REPUBLIC OF SOUTH AFRICA

² St. Petersburg University, RUSSIA

³ Lumex-marketing LLC, RUSSIA

The mercury concentration in coal varies in a wide range (from few ppb to hundreds ppm) with the world average of 100 ppb. Peculiarities of the mercury distribution in productive horizons are governed by syngenetic and superimposed geochemical processes that can lead to a great variability of the mercury concentration even within a same deposit. Significant variability of the mercury concentration was revealed in South African coals from various coal basins. The highest mercury content was found in coal from Mpumalanga province with the maximum concentration of 2514 ± 90 ppb and the lowest with the value of 3 ± 2 ppb - in coal from KwaZulu-Natal province. Mercury speciation in coal can be represented by syngenetic mercury bound to organic matrix, by elemental, ionic and isomorphic mercury bound to sulfides, oxides, and silica minerals. A study of such speciation can be made using several techniques, such as sequential chemical extraction procedure, separation of organic and mineral parts of coal matrix, advanced X-ray spectroscopy, thermospeciation analysis, and some other. Two techniques were applied to investigate regularities of mercury distribution in South African coals: thermospeciation and matrix separation by specific gravity. Thermospeciation technique (gradual heating of a sample and registration of the mercury release vs temperature) enables one to determine portions of mercury having different binding energy with matrix. The low-temperature peaks can be attributed to mercury bound by physical sorption and occluded, and the mid- and high- temperature peaks to mercury bound to organic coal matrix, sulfides, and silicates. Separating coal by specific gravity showed that in some coals mercury accumulates in organic components of coal, whereas in other coals it accumulates in inorganic components, such as sulfides that confirms the data of the thermospeciation analysis. Knowing of mercury speciation can be applied for enhancement of the coal pre-treatment technology to reduce mercury emissions to environment. The research is supported by the National Research Foundation of South Africa, the Russian





MEC 14 HANOI, VIETNAM
WORKSHOP 28-30 OCT 2019

Foundation for Basic Research, Project № 14-05-93961, and by Lumex-marketing LLC.



IEA
CLEAN COAL CENTRE