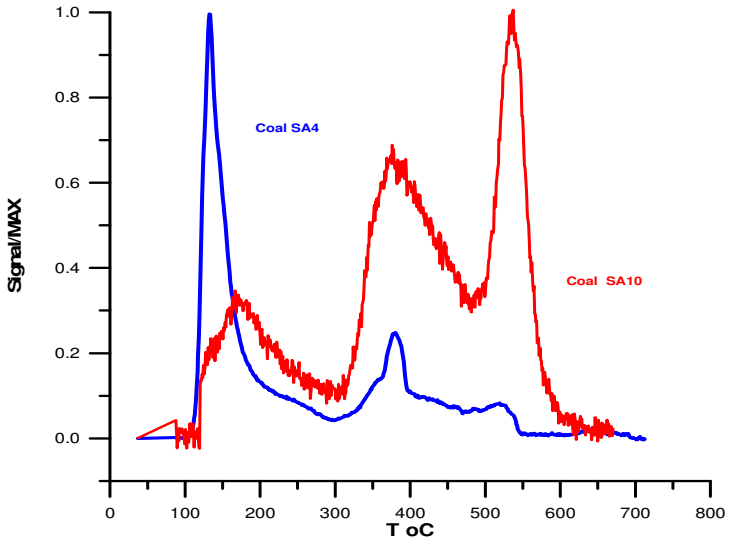
MERCURY THERMOSPECIATION IN COAL

INTRODUCTION

The mercury concentration in coal varies in a wide range from less then 1 ppb to 300 ppm. Commonly, the total mercury concentration in coal is studied. However, geological processes generate various mercury species in coal and host rocks which can be represented by syngenetic mercury bound to organic matrix; sulfide, silica and carbonate minerals, and by elemental Hg. These species have different matrix binding energy and can be determined by the so-called thermoscanning technique based on the real-time detection of mercury release from a sample during its gradual heating.

MEASUREMENT METHOD

The analytical set consists of a standard **RA-915M** Zeeman AAS mercury analyzer coupled with a **PYRO-915+** pyrolysis attachment. Special automated mode of the gradual heating of the sample from ambient temperature to 850 ^{O}C with a mean heating rate of 0.8 degree per sec is used to detect mercury thermospecies in coal. In the same run, the total mercury concentration is determined. The analysis of various types of coals reveals variously shaped mercury thermospectra [1].



Thermospectra of mercury in bituminous coal from Vaal (SA4, total Hg 540 ppb) and Highveld (SA10, total Hg 195 ppb) coal fields (South Africa).

The low-temperature peaks can be attributed to mercury bound by physical sorption and occluded, whereas the mid- and high- temperature peaks to mercury bound to organic coal matrix, sulfides, and silicates. The technology enables identifying mercury bound to pyrite and other sulfides. The thermoscanning technique gives additional information about mercury speciation in samples.

EQUIPMENT AND REAGENTS

The following equipment and materials are used for analysis:

- Mercury analyzer RA-915M with PYRO-915+ attachment;
- PC with Windows® XP/Vista/7/8/10 and RAPID software;
- CRM of mercury.

1. Mashyanov, N. R., Pogarev, S. E., Panova, E. G., Panichev, N., & Ryzhov, V. (2017). Determination of mercury thermospecies in coal. *Fuel*, 203, 973-980. **doi:10.1016/j.fuel.2017.03.085**