

Suitability of activated carbons for mercury adsorption and influence of material properties on mercury adsorption mechanism

Stefan Thiel¹, Dr.-Ing. Steffen Krzack¹
¹IEC, TU Bergakademie Freiberg, Germany,

email (Presenter): Stefan.Thiel@iec.tu-freiberg.de

Due to the newly introduced regulations on mercury emissions in the EU by ratification of the Minamata convention [1], an increasing demand for effective segregation techniques occurs. One possibility is the adsorptive reduction of mercury in the flue gas by using activated carbons.

Therefore, different brown coal products were used as feedstock for the production of activated carbons by pyrolysis and gas activation processes. The feedstock materials were separated from different steps of the extraction process of the well-known montan wax producing company ROMONTA in Amsdorf, central Germany. The conditions for the pyrolysis experiments varied between 850 and 1050 °C, 30 and 60 minutes of residence time and 5 to 10 K/min heating rate. As reference, commercially available activated carbon HOK® from RWE/Rheinbraun GmbH was used.

Beneath pulverized raw materials, granulated feedstock materials were investigated as well. Among other things, the products were characterized by mercury porosimetry, specific inner surface via nitrogen isotherms as well as the dynamic adsorption capacity of mercury and sulphur-dioxide to determine the influence of the materials properties on the mercury adsorption mechanism.

The main results showed superior dynamic adsorption capacities for the activated carbon products of ROMONTA raw materials. This is mainly based on the distinct higher amount of sulphur in coals located in central Germany towards other German deposits. This fact leads to an increased mercury adsorption by enabling the so-called co-adsorption of mercury and sulphuric compounds.

Additional experiments showed that a prior extraction process for the production of raw montan wax does not influence the adsorption properties in a negative way. This enables the introduction of an added value by creating a material use instead of the previously energetic usage of the waste product extracted coal.

References

- [1] Regulation of the European Parliament and of the Council on mercury (EC) 2017/852