**Advanced System for Reduction of Mercury Emissions in Model Gases by Modified Sorbents.**

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# Advanced System for Reduction of Mercury Emissions in Model Gases by Modified Sorbents

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Pollution of mercury and its impact on the health of living organisms is of global importance. Mercury is the most dangerous of all heavy metals that can be exposed to humans and wildlife. Sources of mercury are both natural and industrial[1]. Important sources of mercury emissions are: coal based power generation, waste incineration, chemical industry, cement producing plants, and non-ferrous metal production. Toxic forms of mercury enter the environment and bio-accumulate in living organisms. Bioactive components of mercury threaten animal and human health[2]. Mercury occurs in toxic organic-metallic forms (e. g. methyl mercury and similar compounds) and inorganic compounds (e. g. $HgCl_2$). Generally Hg can be present in three forms (speciations): $Hg^0$, $Hg^{2+}$ and $Hg_p$. The most important mercury form from its speciation is elemental $Hg^0$, the compounds of the oxidized mercury $Hg^{2+}$ and mercury adsorbed/bound on dust particles ($Hg_p$). In emission legislation more stringend limits for total mercury emissions are expected since 2021. In Hg-emission monitoring chemical speciation of mercury is also important[3]. Efficient removal of oxidized forms of mercury from gases is feasible by wet absorption/scrubbing methods. Impregnated solid sorbents are used in dry methods for mitigation of Hg-emissions. Suitable impregnation of sorbents (e. g. active carbon) is based on sulfur, sulfides/polysulfides, $FeCl_3$, etc.[4,5]

The aim of my work is to build an apparatus for study of the Hg-sorption processes from model wet gases on differently modified solid sorbents. An important part of the work is reliable, continuous generation of water vapor on desired level of gas moisture, research of the Hg-sorption process at various model gas compositions and sorbents and monitoring the mercury removal process. So far, the measurements of the relative humidity of gas mixture on basis of a simple steam generator have been carried out. We put accent on development of temperature control for transport of model gases to the

sorption column and on separation of selected gaseous components for selective measurement of elemental Hg downstream the column. We suppose, it will be possible to perform semi-continuous analysis of mercury species $Hg^0/Hg^{2+}$ in gas. Results of the measurements will be used for evaluation of the efficiency of mercury removal by modified sorbents in model wet and dry gases.

Accompanying theoretical studies are focused on the thermodynamic equilibria of sorption processes and reactions of mercury with selected gaseous compounds. The experimental apparatus is being innovated for monitoring and control via PC.

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