

Thermal behaviour of powdered activated carbon and sewage substances after the separation by a combined electrocoagulation and electroflotation process

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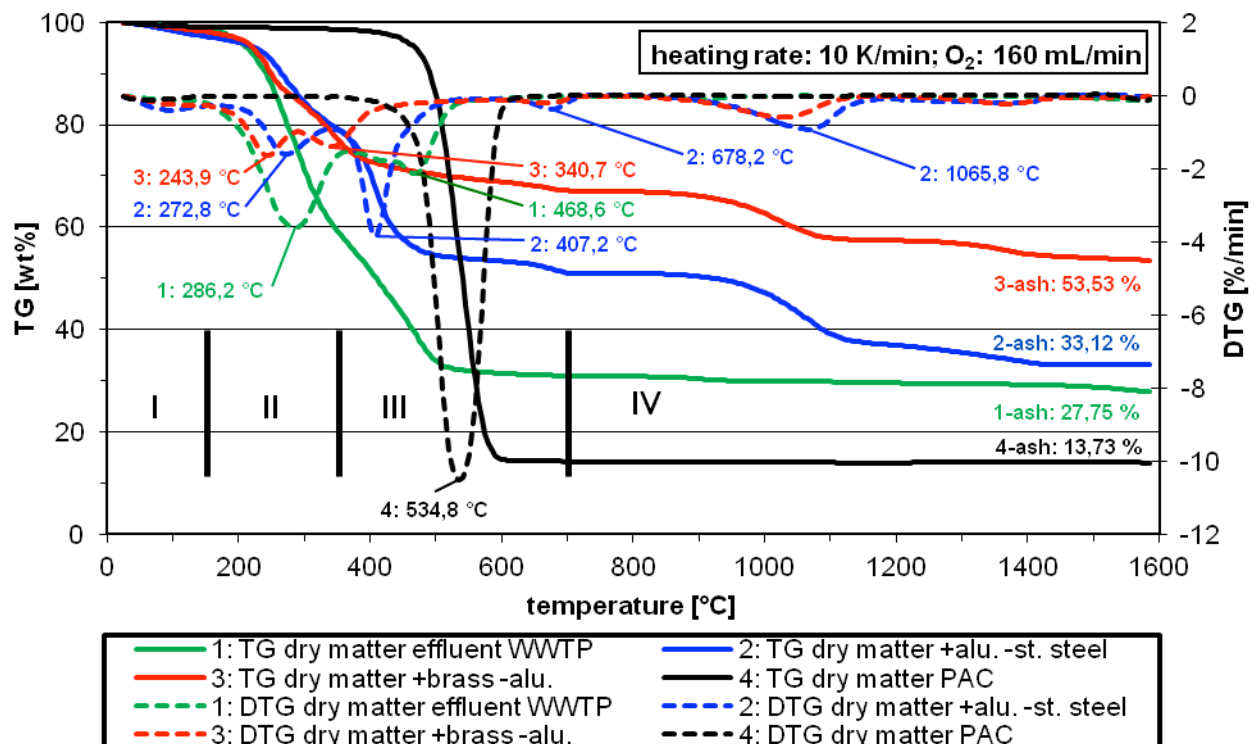
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Due to its high adsorption capacity, powdered activated carbon (PAC) is used more and more frequently in wastewater treatment plants (WWTP) for the removal of microconstituents, e.g. pharmaceuticals, hormones, pesticides and industrial chemicals. Subsequent removal of the loaded fine fraction of PAC particles is challenging. Besides mechanical separation processes such as sedimentation or filtration, PAC and other solid sewage substances can be removed by electrochemical processes, e.g. electrocoagulation and electroflotation.

In this work the thermal degradation behaviour of electrochemically separated PAC and sewage solids was investigated by thermogravimetry. Different electrode materials (aluminium, stainless steel and brass) were tested for separation of solids. The following figure shows the results of the thermal analysis of solids collected using different electrode configurations.



As result five characteristic, material specific temperature ranges can be defined:

- I. Desorption and evaporation of H₂O retained by capillary action: 25 – 150 °C
- II. Oxidation/decomposition/transformation of substances easy to degrade: 150 – 350 °C
- III. Oxidation/decomposition/transformation of substances hard to degrade: 350 – 700 °C
- IV. Transformation of inorganic substances and metal residues: 700 – 1585 °C
- V. Ash and remaining solids: > 1585 °C

Thermogravimetric analysis enables the evaluation of mass-loss characteristics of solid samples produced by electrochemical treatment processes with respect to these defined temperature ranges (group I-V). Comparison of samples with different thermal degradation characteristics allows for classifying and quantifying their content of PAC (group III), sewage substances (group II) and inorganic substances, metal residues as well as ash (group IV-V).