

Abstract

In my work I have dealt with the comparison of different types of biochar based solid materials, which could serve as a filling for ammonia capture filters. Three samples of biochar prepared from anaerobically stabilized sewage sludge were used to test the most suitable material at temperatures of 200 ° C, 400 ° C and 600 ° C, 3 samples of biochar prepared from oak wood at temperatures of 260 ° C, 400 ° C and 600 ° C, 2 samples of biochar prepared from a mixture of sewage sludge and wood chips pre-dried in a pilot scale biological drying plant, dried anaerobically stabilized sewage sludge and charcoal. The materials were impregnated with 50% sulfuric acid solution. They were then exposed to ammonia vapors for the time needed to complete the reaction on the surface of the impregnated material. Due to the chemical reaction, ammonium sulfate is produced, which can be used as a fertilizer in agriculture. It is known that the addition of biochar has a positive effect on the soil. In the case of a combination of biochar and ammonium sulphate, this may be an interesting soil additive. It could be an alternative to so-called scrubbers, where ammonia is trapped by bubbling dilute sulfuric acid. Transportation and application of the ammonium sulphate solution thus formed is not economically advantageous.

To characterize the impregnated materials in more detail, hydrophobicity and water absorption were determined to predict the efficiency of ammonia capture for the material. With regard to further use of material in agriculture, the content of polyaromatic hydrocarbons (PAHs) was further monitored. Contrary to expectations, the capture efficiency was indirectly correlated with the specific biochar surface area. The mechanism of ammonia capture is likely to be a combination of several factors.

After evaluating the results of the individual tests, K-400 and K-600, the biochar prepared from sewage sludge at temperatures of 400 and 600 ° C, showed the best results of ammonia capture. Relatively high capture was also observed for dried sewage sludge and sample K-200. When increasing the scale of the experiment, it is necessary to take into account the energy intensity of the biochar preparation and to choose a compromise with a slightly reduced capture efficiency at a lower biochar (torrefaction).

Key words: biochar, ammonia, sulfuric acid, ammonium sulfate, sewage sludge