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Subject Area	Wasseraufbereitung
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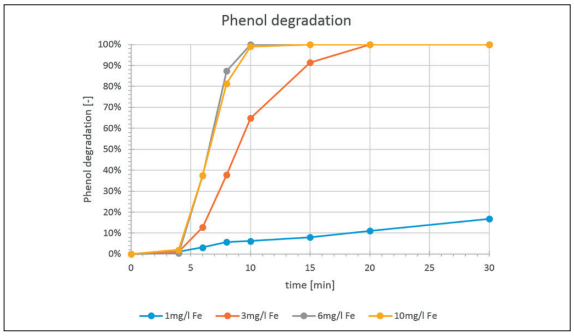
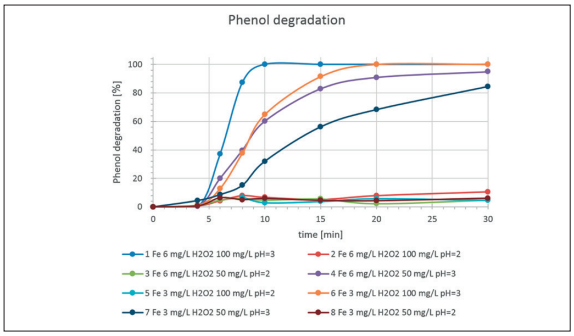
Advanced Oxidation Process for Phenol Degradation

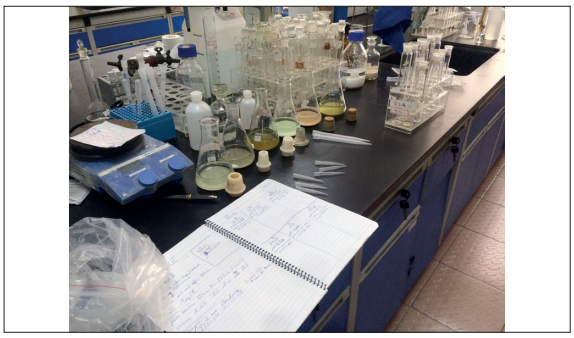
Degradation of phenol in waste-water through a heterogenous Fenton reaction aided by the use of resin



The degradation of Phenol with a homogeneous Fenton reaction under different iron concentrations



Phenol degradation under different conditions. Variation of pH, iron and hydrogen peroxide concentrations



Workplace in the laboratory in Shanghai. In the flasks the six examined resins

This project was realized at the «School of Resources and Environmental Engineering», which is a department of the «East China University of Science and Technology» (ECUST). Their research focus is on the treatment of electroplating wastewater by means of various advanced oxidation processes. A main research topic at the moment is the heterogeneous Fenton process for the elimination of phenol from water. Phenol is (moderately) poisonous and often appears in waste-water. In order to remove it from the water, the so called Fenton reaction is employed. An improvement to this process is the use of resins for a more resource efficient degradation. In this project some resins that were provided by ECUST were to be examined for their suitability for this advanced oxidation process.

First, the degradation in a homogeneous reaction without resin was examined. This resulted in an optimized mixture of ferrous iron, and hydrogen peroxide at an appropriate pH level. This mixture was later used for the heterogeneous reaction (with the resin). For a heterogeneous Fenton reaction, a resin needed to be preloaded with ferrous ions, which were supposed to be irreversibly anchored into the resin. Various resins were loaded under different conditions and with different methods. Then the loaded resins were tested for their performance.

It was observed that the ferrous iron ions were not sufficiently strongly anchored into the resins but were spontaneously released from the loaded resins when immersed into the phenol-hydrogen peroxide solution. Consequently, the conventional homogeneous reaction was triggered and not the desired heterogeneous reaction. Despite various experiments this problem could not be overcome and the experiments didn't lead to a satisfactory final result. However, with the data gathered, the foundation was laid for further tests, which might lead to a functional loading and degradation process. The homogeneous reaction showed that a concentration ratio phenol:H_2O_2:iron of 1:0.12:2 gives an efficient and fast phenol degradation.