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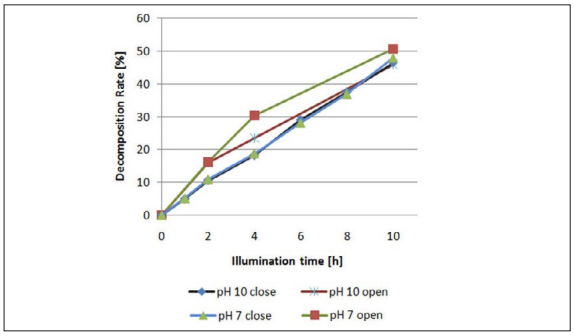
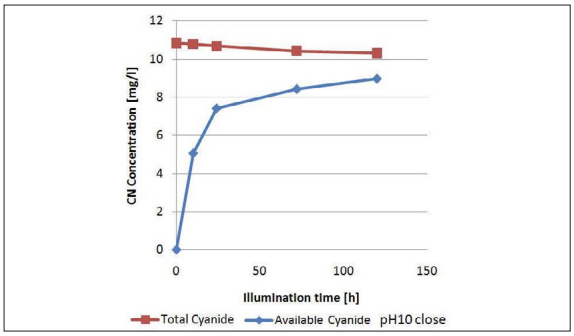
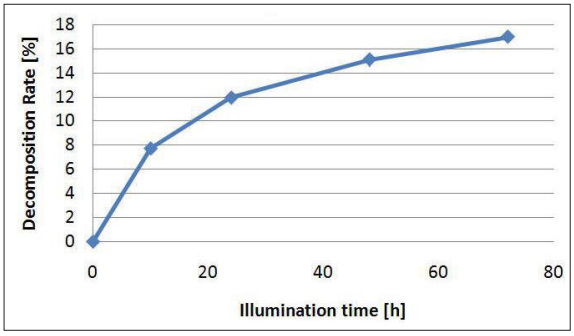
Photochemical Decomposition of Iron Cyanide Complexes in Ferricyanide Solution and Coking Wastewater



Decomposition Rates for Ferricyanide Solution



Long-term Experiment on Ferricyanide Solution



Decomposition Rate for Coking Wastewater

Problem: Cyanide has the ability to form various stable complexes with a range of metals. Cyanide-contaminated wastewater is often treated by biological processes, such as a pre-denitrification. This technique is only effective for «available» cyanide, especially for free cyanide (HCN, CN^-). Consequently, before treatment, the ferricyanide complexes are removed from the wastewater by means of a coagulation process. Before disposal, this sludge is treated by a complex and expensive treatment.

Approach/Technologies: The idea of this project is to substitute the coagulation process with a photochemical process. If the iron cyanide complexes are first split into free cyanide and iron complexes, a higher degree of purification could be accomplished in the biological treatment downstream. Therefore, the objective of this work is to determine the photochemical decomposition of iron cyanide complexes in ferricyanide solution and in coking wastewater under different conditions.

Result: A consolidated view of all the investigated variables of the photochemical decomposition indicates an almost linear decay during the first ten hours, and a non-linear decay afterwards. In fact, with a light intensity of 4,300 Lux, the decomposition rate in the ferricyanide solution is around 50% within 10 hours. More than 80% of the total cyanide is released as free cyanide after 5 days of illumination. During the coking wastewater experiment, the increase in available cyanide was much less than in the experiments with ferricyanide solution. It is assumed that this is due to the dark colour of the coking wastewater which prevents the light from penetrating deep into the solution. These results provide a basis for assessing the photochemical decomposition of iron cyanide complexes. Even if the decomposition in coking wastewater with the light intensity investigated is not as much as was hoped for, the process works in principle, and part of the iron cyanide complexes are actually broken down. In a next step, it should be clarified if it is possible to include a photochemical process such as this into a wastewater treatment procedure.