

DEGRADATION OF PERHALOGENATED CONTAMINANTS

Christian Jung, Anke Nietsch and Marion Senholdt

German Aerospace Center (DLR), Linder Hoehe, 51147 Cologne (Germany), phone: +49 2203 601 2940, e-mail: christian.jung@dlr.de

1. Introduction

Tetrachloroethene (perchloroethylene, PCE) is used for dry cleaning and for degreasing in metal-cleaning operations. Due to its persistence and the widespread application, there are numerous contaminated sites. As remediation usually affords years, solar photocatalysis could be applied to establish a technique with low operational costs.

Within this study, the degradation of PCE has been checked via light enhanced Fenton reaction and titanium dioxide photocatalysis. A solar prototype reactor has been applied.

2. Approach

In a solar prototype plant batches of PCE (140 liters with 10 mg/l) were treated with the solar light enhanced Fenton reaction and titanium dioxide (TiO_2) photocatalysis. The formation of chloride as the main degradation product was analyzed with ion chromatography.

3. Results

Under solar irradiation the model wastewater batches could be cleaned from PCE within less than 30 minutes even at mediate irradiation conditions with TiO_2 photocatalysis. The chloride analysis within the Fenton experiments revealed significant scattering of the measurements but indicate also fast degradation.

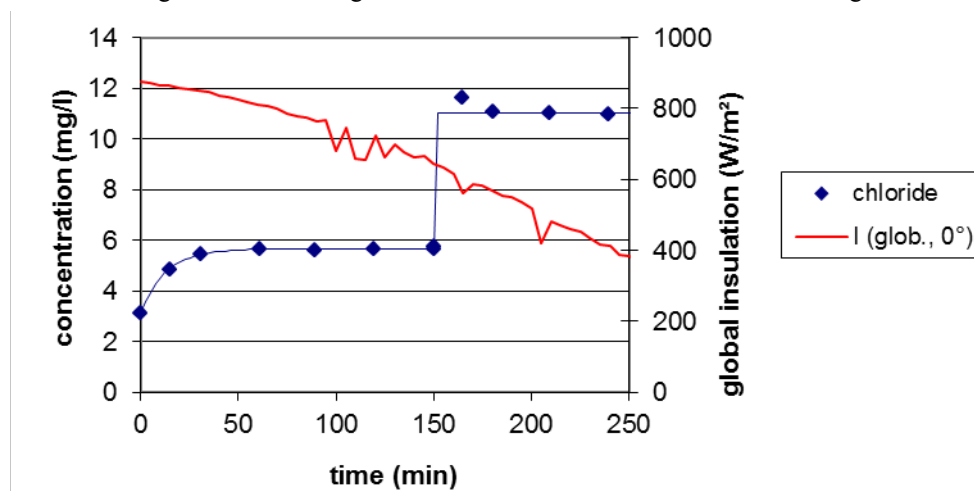


Fig. 1: Chloride concentration and global solar irradiation during the degradation of PCE with TiO_2 photocatalysis.

The experiments indicate that PCE can be converted into harmless chloride with solar photocatalysis even at high initial concentrations. An absolute mass balance deficit of chloride was observed in all experiments. Qualitative analysis with GCMS gave no evidence for organic side products. This is most likely due to PCE losses during the preparation of the model waste water. Hence, total and fast degradation of PCE can be expected from solar photocatalysis.