

Abstract

The dissertation presents results of research concerning the development of method for remediation of soil contaminated by pesticides. The chemical method based on the use of ozone as an oxidant was utilized. The soil remediation process was carried out using a fluidized bed reactor. The use of this technique solved the problem of mass transfer limitation, which has a significant impact on the effectiveness of the soil detoxification process. The results of laboratory and quarter technological scale research were presented.

According to the National Waste Management Plan (KPGO 2006) by the end of year 2018 the issue of remediation of soil from the areas, where in the near past overdue and banned pesticides were stored. Up to date in Poland the main way to tackle the consecutive contamination as a result of desorption of pesticides to groundwater is transportation of the contaminated soil to hazardous waste disposals. This results in an additional transport costs and the constant need for treatment of leachate.

An alternative solution is the remediation of pesticide contamination soil using one of the available remediation methods. Although numerous methods for disposal of hazardous waste are already available, there are only a few studies on the remediation of soil contaminated by pesticides.

The dissertation describes research on remediation of soil contaminated by pesticides using ozone. Ozone is a strong oxidant which is already used in environmental protection to remove chemical and biological contaminants that are present in water, soil, wastewater or other matrices.

Due to limitations in the diffusion process in the soil matrix, in which the reactions take place in a gas-solid system, fluidization was used to improve mass exchange process.

The combination of both processes is possible by feeding the reactor chamber with gas stream (in the case of the research it was the air and ozone. The use of fluidization process provides good mass transfer between the phases, which has a positiv impact on the kinetics of degradation of pesticides.

It should be noted that the methods based on the use of ozone were extensively described for processes of purification of drinking water and sewage treatment. However, the use of ozone in the processes of decomposition of organic pollutants occurring in gas-solid, was described mainly for PAH, for example Masten et al., 1997, However there is a lack of investigations regarding pesticides.

As a result of the conducted research it was possible to confirm the effectiveness of the proposed method on a laboratory scale, and describes the procedure for the transfer of this procedure into the technical quarter scale. Monitoring of pesticide concentration in soil was conducted using the GC-MS system. Additionally soil characteristic was analyzed and the parameters such as pH, the nitrate content and the level of total organic carbon before and after ozonation were determined. Moreover, in order to better assess the effectiveness of the soil remediation process a test organism (*Lepidium sativum* L.) was utilized. In these studies the weight of the aerial parts of the plant and the degree of inhibition of germination were compared. The study also addresses the literature data, pointing to the competitiveness of the presented method.