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工程热物理

农药生产废渣燃烧/热解特性研究

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摘要： 在30 ℃/min升温速率下，利用热重分析方法对农药生产废渣热解和燃烧过程进行了分析，发现农药废渣燃烧过程可以分为两个阶段：150~400 ℃和400~600 ℃。在600 ℃时，农药废渣的燃烧反应程度已经达到了96%。农药废渣热解和燃烧过程的第1个失重阶段基本重合。利用Achar法求得了农药废渣燃烧和热解过程的反应机理函数，以及表观动力学参数。分析发现热解与燃烧第1阶段的反应机理函数相同。利用热重－傅里叶变换红外光谱分析对30 ℃/min升温速率下农药废渣热解和燃烧过程中的气体析出情况进行了分析，发现农药废渣热解过程中，有大量的SO2析出，SO2的析出集中在300~600 ℃区间内，在此区间内，还有少量的CO2和H2O析出，CO的析出主要在高温段发生。对燃烧条件下的FTIR分析表明，氧气的存在使得SO2的析出提前，农药废渣中的N在较低温度下以NH3的形式释放，而在热解条件下，农药废渣中的N的释放主要是高温区生成的HCN。

关键词： 农药废渣 热解 燃烧 热重－傅里叶变换红外光谱分析 活化能

Combustion and Pyrolysis Characteristics of Pesticide Residue

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Abstract: The pyrolysis and combustion characteristics of pesticide residue were investigated using thermogravimetric analysis(TGA) in the atmosphere of nitrogen and air. The heating rate profile of 30 ℃/min was applied . The results indicate that the entire combustion process under the experimental conditions of this investigation consists of two distinct stages: 150-400 ℃ and 400-600 ℃. Around 96% of total combustion degradation was finished before 600 ℃. It is found that there was a superposition phenomenon between the first stage of combustion and the pyrolsysi. The kinetic parameters and the mechanism function were obtained by using the Achar method, which indicates that the kinetic function of pyrolysis mechanism is in perfect accordance with the first stage of combustion process. The gaseous products evolving from pyrolysis of pesticide residue were investigated using thermogravimetric analysis in conjunction with Fourier transform infrared spectroscopy (TG-FTIR) at the heating rate of 30 ℃/min. The results show that SO2 is the main gaseous product in the temperature range of 300~ 600 ℃, accompanied with a little amount of other gases such as CO2 and H2O, and CO emitted at high temperature during pyrolysis. It was found that the emitted of SO2 was accelerated by O2. The nitrogen-containing gaseous product was NH3 at a lower temperature during combustion of pesticide residue, and HCN is emitted as the main nitrogen-containing gaseous product at high temperature during pyrolysis.

Keywords: pesticide residue pyrolysis combustion thermogravimetric analysis-Fourier transform infrared spectrometer activation energy

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