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Formation of polycyclic aromatic hydrocarbons during pyrolysis of sewage sludge from various wastewater treatments

Yuanyuan Xia
Zhejiang University of Technology, China

Disposal of sludge as a byproduct from wastewater treatment plants is a significant environmental concern throughout the world. The contaminants in sludge pose challenge for its effective disposal. Sludge contains inorganic and organic contaminants. One such class of organic contaminant is polycyclic aromatic hydrocarbons (PAHs). The source of sludge decides on the differences of their physical and chemical properties. In order to comprehensively study the generation and evolution characteristics of PAHs and analyze the possible sources of PAHs in sewage sludge pyrolysis process, this study selected sewage sludge sampled from different industrial production to investigate and analyze the generation characteristics of PAHs during sewage sludge thermal treatment. A few types of sewage sludge samples after treatment of Xiaoshan food processing wastewater, Xiaoshan printing and dyeing wastewater, Qige industrial wastewater and Linan municipal wastewater were selected to conduct pyrolysis experiments in a tubular furnace. It was found that the volatile content of sludge had a significant impact on the generation of PAHs in pyrolysis products. Under the condition of high and low temperature, the content of PAHs in liquid phase products and gas phase products of Linan sludge and printing and dyeing sludge with higher volatile content were higher than that of Qige sludge and food processing sludge with lower volatile content. The volatile content of Linan sludge is similar to that of printing and dyeing sludge, but the printing and dyeing sludge PAHs content in liquid, gas pyrolysis products (17.40 mg•kg-1, 450°C; 51.25 mg•kg-1, 850°C), far higher than Linan sludge (3.51 mg•kg-1, 450°C; 15.25 mg•kg-1, 850°C). Low-rings PAHs are dominant in the pyrolysis products, however, high ring PAHs in Qige sludge pyrolysis products accounted for up to 37.91% (850°C); Linan sludge accounted for more than the minimum of 19.50% (850°C).

zjuthyj@163.com