3 - 58 Research on High Energy Electron Beam Irradiation Treatment of Sewage Sludge

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The sewage sludge was from sewage treatment process and composed mainly by soil particles, solid residues, flocculent materials and other elements containing microorganisms and organic matters and inorganic matters. The total content of industrial and municipal wastewater, going with the social development, increased year by year. Therefore, the quantity of sewage sludge discharged increased dramatically. Because of containing a large number of the pathogen (parasites, bacteria and viruses), organic materials and nutrientelement(N, P, K and so on), untreated sewage sludge could disrupt the ecological environment and damage human health, if it was discharged into the environment directly. Moreover, the beneficial elements of sewage sludge were also wasted[1,2]. Atpresent, the helminth eggs and microbial spores could not be killed thoroughly and some persistence organic contaminants could not be degraded effectively by traditional treatments such as anaerobic digestion, compost and landfill[2-5]. Consequently, a clean, efficient, simple and no second-polluted sludge treatment technology was need urgently and promising.

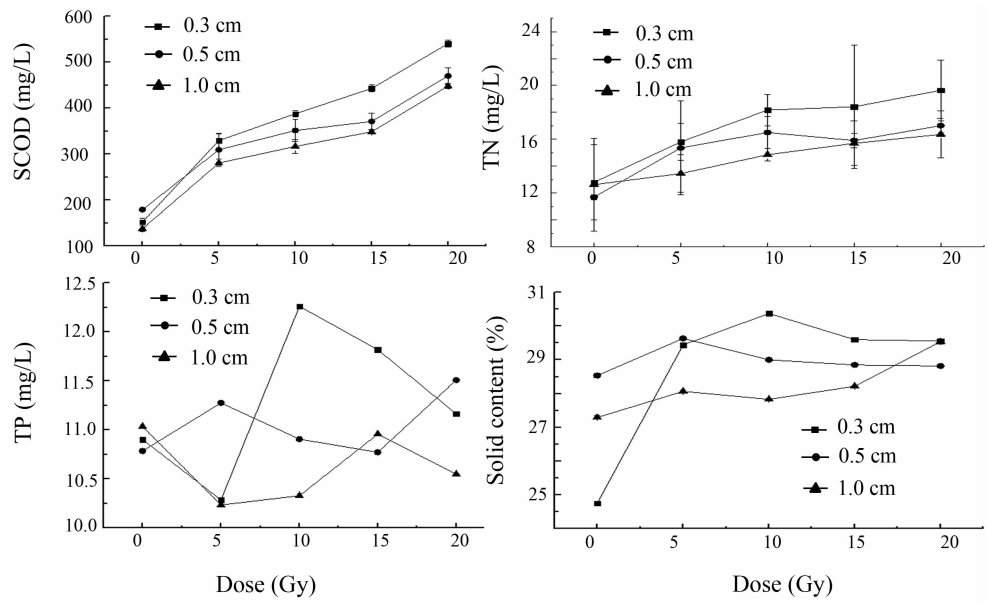

Fig. 1 The SCOD, TN, TP and solid content of high energy electron beam irradiation sludge.

The treatment of sewage sludge by high-power electron beam irradiationas a new promising treatment technologywas studied in order to improve sludge innocent treatment without considering radiationpollution and radioactive source management. The moisture content of sludge which came from Lanzhou city Sewage treatment plant was about 80% and the irradiation dose of the electron beam was 5, 10, 15 and 10 kGy. Three kinds of thickness (0.3, 0.5 and 1.0 cm) sludge were irradiated to research the germicidal efficacy and the change of physical and chemical properties. According to experimental results, it was showed that the thickness of sludge was an important factor to irradiation effect and the germicidal efficacy of high- power electron beam irradiation was approximately 100% via agar plate culture method. The experimental data indicated that the SCOD (Soluble Chemical Oxygen Demand), TN (Total Nitrogen), TP (Total phosphorus) were raised by 72.62%～254.38%, 6.51%～53.24% and 14.19%～36.05%, respectively, and it was also suggested that more organic matter in the sludge released into aqueous phase by the high-power electron beam irradiation, which had many advantages for sludge compost or digestion. Moreover, the release of nitrogen and phosphorus was good to facilitate the irradiation sludge farm and forestry application, and the increase of solid rate which was raised by 0.99%～24.80% showed that, to some degree, the irradiation had dehydration effect to improve resourceful utilizations of sludge.

References

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3 - 59 Effects of Electron Beam Irradiation to Aroma Components in Liquor

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Different dosages (500, 750, 1000, 1250, 1500 Gy) of 1.5 MeV/u electron beam were irradiated liquor samples to study the improvement of aging effects. After irradiation, control six samples' quality and quantity were analysed by gas chromatography. We have analyzed 56 kinds of aroma substances such as aldehydes, alcohols, esters, acids. There are 25 kinds of substance's content remarkable changed. As shown in Table 1, there are three kinds, acetaldehyde, furfural, acetal change significantly, as well as n-amyl alcohol, 14 kinds of esters such as ethyl formate, ethyl acetate, acetic, propionic and 7 kinds of other acids. This result shows that contents of liquor aroma substances can be changed by the electron beam irradiation, and these changes are mainly esters and acids.

Table 1 Concentrations of changed aroma components in liquor samples

Number	Component name	Component Amount(g/L)					
		Control	500 Gy	750 Gy	1000 Gy	1250 Gy	1500 Gy
1	Aldehyde	0.101	0.104	0.104	0.109	0.118	0.114
2	Furfuraldehyde	0.032	0.033	0.028	0.029	0.027	0.025
3	Acetal	0.241	0.239	0.236	0.243	0.262	0.252
4	N-amyl alcohol	0.016	0.017	0.017	0.001	0.001	0.001
5	Ethyl formate	0.166	0.170	0.168	0.173	0.179	0.171
6	Ethyl acetate	0.826	0.783	0.774	0.768	0.788	0.764
7	Ethyl propionate	0.067	0.066	0.066	0.043	0.046	0.069
8	Ethyl butyrate	0.280	0.252	0.248	0.242	0.247	0.242
9	Ethyl iso-butyrate	0.007	0.007	0.007	0.002	0.002	0.007
10	Ethyl lactate	0.792	0.780	0.763	0.782	0.791	0.769
11	Ethyl valerate	0.045	0.038	0.038	0.036	0.037	0.036
12	Ethyl hexanoate	2.226	1.801	1.757	1.634	1.676	1.683
13	Ethyl oenanthate	0.015	0.012	0.011	0.010	0.010	0.010
14	Ethyl caprylate	0.005	0.004	0.003	0.003	0.003	0.003
15	Ethyl palmitate	0.014	0.000	0.000	0.000	0.009	0.000
16	Ethyl Oleate	0.003	0.000	0.000	0.000	0.000	0.000
17	Ethyl linoleate	0.003	0.000	0.000	0.000	0.000	0.000
18	Ethyl decanoate	0.003	0.001	0.001	0.001	0.001	0.001
19	Acetic acid	0.350	0.351	0.347	0.357	0.366	0.361
20	Propionic acid	0.013	0.013	0.014	0.016	0.018	0.021
21	Iisobutyric acid	0.004	0.005	0.005	0.006	0.009	0.013
22	Butyric acid	0.146	0.145	0.144	0.147	0.149	0.147
23	Isovaleric acid	0.014	0.014	0.014	0.014	0.015	0.015
24	Valeric acid	0.017	0.017	0.017	0.018	0.018	0.018
25	Hexylic acid	0.566	0.569	0.561	0.566	0.571	0.561