Experimental Study on DC Corona Radical Shower for the Removal of Toluene

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Abstract: Using DC corona radicals shower to decompose toluene in air, different parameters were studied, such as the concentration of toluene, temperature, voltage, humidity and the settled time. The results showed that the fall of temperature and appropriate humidity can increase the decomposing efficiency of toluene; the efficiency decreased with the increasing of the voltage; the settled time was longer, the decomposing efficiency was higher, but the energy efficiency decreased. Increasing the concentration of toluene made the removal efficiency lower, but in the same time, made the energy efficiency higher. The experiment built a good basis for researching radicals decompose PAHs (dioxins etc.).

Keywords: DC corona; radical shower; VOCs treatment; plasma; toluene
Fig. 1 Flow chart of experiment equipment

Fig. 2 Nozzle electrode sketch map

Fig. 3 Humidity vs decomposing efficiency

Fig. 4 Settled time vs decomposing efficiency
Fig. 5 Concentration vs decomposing efficiency

\[ \text{CH}_3, \text{O}_2 + \text{O}_2 \rightarrow 2 \text{O}_2 + \text{O} \]

\[ \text{H}_2\text{O}^{[19]} \rightarrow \text{CO}_2 + \text{H}_2\text{O} \]

Fig. 6 Temperature vs decomposing efficiency

\[ (0.08 \text{ m}^3/\text{h}; \text{RH} = 60\%) : 600 \text{ mg/m}^3 \]

Fig. 7 Voltage vs decomposing efficiency

\[ (0.08 \text{ m}^3/\text{h}; \text{RH} = 60\%) : 590 \text{ mg/m}^3 \]
75 %.

(2) 9 %.

(3)  

(4)  

(5)  

(6)  

(7)  

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