

$k_o = 1.66 \times 10^4 (\text{mol/ml} \cdot \text{h})$, $E = 35.7 \text{ kJ/mol}$, $b_{o_{\text{异}}} = 1.38 \times 10^{-2} (\text{kPa}^{-1})$, $\theta_{\text{异}} = 25.0 \text{ kJ/mol}$, $b_{o_{\text{O}_2}} = 1.00 \times 10^{-4} (\text{kPa}^{-1})$, $\theta_{\text{O}_2} = 24.7 \text{ kJ/mol}$, $b_{o_{\text{CO}_2}} = 1.34 \times 10^{-5} (\text{kPa}^{-1})$, $\theta_{\text{CO}_2} = 43.8 \text{ kJ/mol}$. 将上述参数值代入(4)式可得

$$r_{\text{CO}_2} = (1.66 \times 10^4 e^{-35700/RT} \times 1.38 \times 10^{-2} e^{25000/RT} \times 1.00 \times 10^{-4} e^{24700/RT} \times P_{\text{异}} P_{\text{O}_2}) / (1 + 1.38 \times 10^{-2} e^{25000/RT} P_{\text{异}} + 1.00 \times 10^{-4} e^{24700/RT} P_{\text{O}_2} + 1.34 \times 10^{-5} e^{43800/RT} P_{\text{CO}_2})^2 \quad (5)$$

将表 1 中 83 组实验值按(5)得出 $r_{\text{CO}_2(\text{计算})}$ 值列表 1.83 组 r_{CO_2} 与 $r_{\text{CO}_2(\text{计算})}$ 的相对误差平均值为 7.52%, 说明(5)式较好地符合实验结果。另外, 用脉冲法测得异丁醇、 O_2 及 CO_2 吸附热分别为 28.9 kJ/mol , 25.8 kJ/mol , 44.8 kJ/mol , 与用正交设计法估计值 25.0 kJ/mol , 24.7 kJ/mol , 43.8 kJ/mol 是一致的。异丁醇完全氧化动力学研究工作尚未见文献报道。(5) 式

完全氧化复杂反应动力学方程在环保催化动力学方程中也是不多见的。

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臭氧对倒挂金钟和蚕豆呼吸作用的影响

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摘要 在较低浓度臭氧作用下, 植物的呼吸受到刺激, 在一定时间内, 这种影响不易消除; 在高浓度臭氧作用下, 植物的呼吸受到抑制, 在一定时间内保持相对稳定, 以后逐渐恢复。分析讨论了臭氧影响植物呼吸变化的机理。

有关臭氧(O_3)对植物呼吸作用影响的研究早在 50 年代就开始了。最早 Erikson 和 Wedding (1956) 研究了臭氧-己烯对柠檬叶片光合作用和呼吸作用的影响。同年 Todd 重复了这一实验。两年后他又采用红外气体分析仪测量了被 O_3 化己烯处理的斑豆叶和柑桔叶对 CO_2 的吸收^[1]。此后, Macdowall (1965) 专题研究了 O_3 对烟草叶呼吸作用的影响, 特别观察了线粒体呼吸作用的变化及其变化机理^[2]。Pell 和 Brennan (1973) 讨

论了受 O_3 伤害的斑豆叶呼吸、光合、三磷酸腺苷等的关系^[3]。近些年来, 还有人研究 O_3 对菜豆根呼吸的影响, 以及 O_3 对杂交杨叶片暗呼吸的影响等。但这些研究结果很不一致。都没有对 O_3 影响呼吸能否恢复等问题作出回答, 然而这些问题对防护 O_3 伤害植物和研究 O_3 伤害机理都有参考价值, 有必要继续深入研究。

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表 1 O_3 对倒挂金钟呼吸强度影响及恢复(呼吸强度单位: $O_2 \mu l/g \cdot h$)

浓度 \ 熏气时间(h)			熏气后时间(h)								
			2	5	20	21	30	50	54	70	100
0.69 (ppm)	4	对照	/	/	/	20.38	/	19.25	/	24.01	/
		处理	/	/	/	34.89	/	23.18	/	33.37	/
		P 值	/	/	/	<0.05	/	>0.05	/	<0.05	/
1.32 (ppm)	2	对照	/	19.57	22.86	/	30.32	/	34.49	/	29.76
		处理	/	14.56	15.62	/	15.08	/	23.52	/	23.66
		P 值	/	<0.05	<0.05	/	<0.01	/	<0.05	/	<0.05
	4	对照	23.06	/	22.86	/	30.32	/	25.03	/	29.76
		处理	19.69	/	15.59	/	20.76	/	25.06	/	32.23
		P 值	>0.05	/	<0.05	/	<0.01	/	>0.05	/	>0.05

一、材料和方法

实验材料为倒挂金钟 (*Fuchsia hybrida* Voss.) 和蚕豆 (*Vicia faba* L.) 按常规盆栽管理。

动态熏气室熏气, 高压电离空气发生 O_3 , 浓度分别采用 0.19、0.29、0.50、0.69、0.83 和 1.23ppm, 浓度测定采用改良碱性碘化钾法^[4], 熏气时间分别为 2 和 4h。

呼吸强度测定采用瓦氏微量测压法, 仪器为 SKW-2 型微量呼吸检压仪。叶片圆盘孔径为 0.6cm, 测定时的振荡频率为 60r/min, 测定结果为三次重复的统计值。呼吸强度以每小时每克鲜重组织吸收氧气的微升数 ($O_2 \mu l/g \cdot h$) 表示。

二、实验结果

(一) 臭氧对倒挂金钟呼吸强度的影响

分别用不同 O_3 浓度和熏气时间来处理倒挂金钟, 测定停止熏气后 2—100h 时的呼吸强度, 其结果如表 1。

从表 1 中可以看出 0.69ppm 浓度的 O_3 使倒挂金钟的呼吸作用受到刺激, 在停止 O_3 作用 70h 时仍保持刺激状态, 而 1.32ppm 浓度的 O_3 则使倒挂金钟的呼吸受到明显抑制, 到停止熏气 30h 后, 抑制才开始缓解, 以逐渐

表 2 不同浓度 O_3 对蚕豆熏气 4h 呼吸强度的比较

O_3 浓度 (ppm)	呼吸强度 ($O_2 \mu l/g \cdot h$)		呼吸强度 的提高率	t 测验	P 值
	对照	处理			
0.19	37.91	47.41	25.06%	16.29	<0.01
0.29	26.14	34.32	31.29%	8.97	<0.05
0.50	33.38	44.42	33.07%	21.97	<0.01
0.83	33.46	35.49	6.06%	4.76	<0.05

趋于恢复。相比较, 植物恢复受抑制的呼吸作用比受刺激的要快一些。

(二) 不同浓度臭氧对蚕豆呼吸作用的影响

分别用 4 种浓度的 O_3 处理蚕豆 4h, 测其呼吸强度如表 2。

从表 2 可见, 不同浓度的 O_3 处理蚕豆植株, 其呼吸强度都有明显的变化, 在 0.5ppm 浓度范围内, 呼吸强度的增加与浓度的增加呈正的相关关系, 0.5ppm 浓度是刺激蚕豆呼吸的峰值浓度。到 0.83ppm 浓度时, 呼吸强度已开始下降。此时的蚕豆叶片已出现伤害症状。

三、讨 论

人们在讨论 O_3 对植物呼吸强度的影响问题上意见很不一致。Todd^[1] 指出 O_3 在斑豆叶未出现症状前就刺激了呼吸, 到叶片出

Wang Xunling, Guo Qingxia (Biology Department, Lanzhou University): *Chin. J. Environ. Sci.*, **11**(2), 1990, pp. 31

The plants, *Fuchsia hybrida* Voss. and *Vicia faba* L., were fumigated with ozone at different concentrations. It was observed that the lower level of ozone would stimulate respiration. Such effect did not easily disappear for a long time after stopping fumigation. However, the higher concentration of ozone inhibited respiration. If the injury caused by ozone was not so severe that the plant respiration could recover to normal.

It is suggested that there might be two kinds of mechanism which control the rise and fall of respiration. These two actions compensate and adjust each other under the conditions of controlling ozone doses, resulting in various phenomena of respiration intensity, such as increasing, decreasing or unremarkable changes, recoverable or irrecoverable, etc.

A Study of Photochemical Pollution with a Box Model. Yu Jinxiang (Department of Atmospheric Sciences, Lanzhou University): *Chin. J. Environ. Sci.*, **11**(2), 1990, pp. 34

A box model for simulating the atmospheric photochemical pollution in a valley region has been developed and verified by using real source emission, meteorological and pollutant concentration data for Xigu district in Lanzhou in August of 1983. The model is utilized to study the impact of source density on the photochemical smog concentration.

Anaerobic Fermentation for Fur Processing Wastewater. Qui Rongchu, Liang Wensheng, Wu Dongfeng (Department of Environmental Engineering, Lanzhou Railway College, Lanzhou): *Chin. J. Environ. Sci.*, **11**(2), 1990, pp. 37

Batch bioassays have been applied to determine the feasibility of anaerobic treatment for two main flows of wastewater from fur processing: for soaking wastewater and for scouring wastewater. The former does not restrict methanogens and can be biodegraded easily under the anaerobic conditions with the methane production of $1.02 \text{ m}^3/\text{m}^3$ while the COD removal percentage as high as 87.6%. In the latter with the methane production of $0.82 \text{ m}^3/\text{m}^3$, detergent DG7 can not be biodegraded anaerobically, but can be adsorbed on sludge and shows effects of restriction to methanogens that can be acclimated, even there is no influence on the anaerobic process when the concentration of DG7 is less than 50–100 mg/L. It is

reasonable for the scouring wastewater to be treated anaerobically with the soaking wastewater or other sewage at the same process.

Heat Feedback in the Catalytic Combustion and Safe-controlling Technology. Su Jianhua, Wang Boduo (The Seven Design and Research Institute of the Ministry of Mechanical-Electrical Engineering Industry, Xi'an): *Chin. J. Environ. Sci.*, **11**(2), 1990, pp. 41

This paper deals with the problem of heat feedback and safe control in catalytic combustion of organic waste gas. The increase of gas concentration will lead to the increase of temperature in catalyst bed entrance. If ignition temperature is higher than 350°C , normal heat equilibrium will be destroyed. The authors have concluded that in order to guarantee safety of the system, concentration of waste gas entering into the catalyst bed should be controlled by means of continuous quantitative detection of the gas.

Analysis of Chemical Composition of Activated Sludge. Liu Lifeng, Zhao Shuchang, Deng Yizhao (Dalian University of Technology, Liaoning Province): *Chin. J. Environ. Sci.*, **11**(2), 1990, pp. 45

This work is to analyse chemical composition and related characteristics of the sludge sampled from Tianjin Sewage Plant with infrared spectrophotometry and thermogravimetry. The activated sludge derived from wastewater treatment process contains the elements of C, H, O, N, S, P, and mainly belongs to aliphatics in structure. There exist organic groups known as proteins, oil, fibre and humic acid, which will be potential sources of raw material of chemical engineering and alternative fuel.

Detection of Trace PCDFs in China-made Pentachlorophenol. Jiang Ke et al. (Research Center for Eco-Environmental Sciences, Academia Sinica, Beijing); Deng Lin, Li Zhongmin (Beijing Institute of Technology): *Chin. J. Environ. Sci.*, **11**(2), 1990, pp. 48

Extremely toxic PCDFs (polychlorinated dibenzofurans) can be formed in the production of pentachlorophenol as by-products. PCDFs including 4–8 chlorine atoms have been identified in China-made Pentachlorophenol using MS/MS method. It is considered as one of the main sources of PCDFs contamination in China. This analytical method has been recommended for application