

JES

JOURNAL OF
ENVIRONMENTAL
SCIENCES

ISSN 1001-0742
CN 11-2629/X

2013 Volume 25 Supplement
www.jesc.ac.cn

The 5th International Symposium on Environmental Economy and Technology



Sponsored by
Research Center for Eco-Environmental Sciences
Chinese Academy of Sciences

CONTENTS

The 5th International Symposium on Environmental Economy and Technology (ISEET-2012): Preface	
Dong-Ying Ju	S1
Improvement of production of lipopeptide antibiotic iturin A using fish protein	
Umme Salma Zohora, Mohammad Shahedur Rahman, Abdul Wahab Khan, Masahiro Okanami, Takashi Ano	S2
Determination of vanillin in vanilla perfumes and air by capillary electrophoresis	
Saaya Minematsu, Guang-Shan Xuan, Xing-Zheng Wu	S8
Economic analysis of gradual “social exhaustion” of waste management capacity	
Hideo Koide, Hirofumi Nakayama	S15
Determinants of eco-efficiency in the Chinese industrial sector	
Hidemichi Fujii, Shunsuke Managi	S20
Study on preparation and microwave absorption property of the core-nanoshell composite materials doped with La	
Liqiu Wei, Ruxin Che, Yijun Jiang, Bing Yu	S27
Application of hinokitiol potassium salt for wood preservative	
Junyi Hu, Yu Shen, Song Pang, Yun Gao, Guoyong Xiao, Shujun Li, Yingqian Xu	S32
Synthesis and characteristic of polyaniline/Dy ₂ O ₃ composites: Thermal property and electrochemical performance	
Shaoyu Wang, Yan Li, Zihang Huang, Hui Li	S36
Numerical simulation of alga growth and control in Dalian Bay	
Ying Li, Caisheng Huang, Jiti Zhou	S41
Simultaneous preconcentration of cadmium and lead in water samples with silica gel and determination by flame atomic absorption spectrometry	
Hongbo Xu, Yun Wu, Jian Wang, Xuewei Shang, Xiaojun Jiang	S45
Effect of stress corrosion cracking at various strain rates on the electrochemical corrosion behavior of Mg-Zn-In-Sn alloy	
Zhan Yu, Dongying Ju, Hongyang Zhao	S50
Study on the optical property and surface morphology of N doped TiO ₂ film deposited with different N ₂ flow rates by DCPMS	
Honglin Liu, Tingting Yao, Wanyu Ding, Hualin Wang, Dongying Ju, Weiping Chai	S54
Preparation of MgO/B ₂ O ₃ coatings by plasma spraying on SUS304 surface and effects of heat-resistant	
Bo Song, Ningning Zhou, Dongying Ju	S59
Degradation mechanism of Direct Pink 12B treated by iron-carbon micro-electrolysis and Fenton reaction	
Xiquan Wang, Xiaokang Gong, Qiuxia Zhang, Haijuan Du	S63
Synthesis and characterization of agricultural controllable humic acid superabsorbent	
Lijuan Gao, Shiqiang Wang, Xuefei Zhao	S69
Electrochemical in situ regeneration of granular activated carbon using a three-dimensional reactor	
Hong Sun, Zhigang Liu, Ying Wang, Yansheng Li	S77
Photocatalytic degradation of C. I. Reactive Red 24 solution with K ₆ SiW ₁₁ O ₃₉ Sn ^{II}	
Guixiang Guo, Xiuhua Zhu, Fuyou Shi, Anning Wang, Wei Wang, Jun Mu, Quanli Wan, Rong Zhang	S80
Microalgae cultivation using an aquaculture wastewater as growth medium for biomass and biofuel production	
Zhen Guo, Yuan Liu, Haiyan Guo, Song Yan, Jun Mu	S85
Determination of thiocyanate in the vacuum carbonate desulfurization wastewater	
Luyuan Wang, Lin Dong, Wenhui Song	S89
Effect of acid solutions on plants studied by the optical beam deflection method	
Liangjiao Nie, Mitsutoshi Kuboda, Tomomi Inoue, Xingzheng Wu	S93
Synthesis of the starch grafting of superabsorbent and high oil-absorbing resin	
Zhi Xu, Qingzhi Fei, Xiaoyu Zhang	S97
Effect of calcium on adsorption capacity of powdered activated carbon	
Gang Li, Junteng Shang, Ying Wang, Yansheng Li, Hong Gao	S101
Interface-mediated synthesis of monodisperse ZnS nanoparticles with sulfate-reducing bacterium culture	
Zhanguo Liang, Jun Mu, Ying Mu, Jiaming Shi, Wenjing Hao, Xuewei Dong, Hongquan Yu	S106
Influence of reactivation on the electrochemical performances of activated carbon based on coconut shell	
Xin Geng, Lixiang Li, Meiling Zhang, Baigang An, Xiaoming Zhu	S110
Effect of mass fraction of long flame coal on swelling pressure and microstructures of cokes	
Zhenning Zhao, Jinfeng Bai, Jun Xu, Yaru Zhang, Xiangyun Zhong, Hongchun Liu, Dekai Yang	S118
Screening of endophytic bacteria against fungal plant pathogens	

Tatsuya Ohike, Kohei Makuni, Masahiro Okanami, Takashi Ano	S122
Isolation of antifungal bacteria from Japanese fermented soybeans, natto	
Daichi Murata, Sayaka Sawano, Tatsuya Ohike, Masahiro Okanami, Takashi Ano	S127
Evaluation of the water quality of the Hakata River based on diatoms	
Masami Sakai, Mitsuyasu Kawakami, Kei Amada	S132
Entrepreneur environment management behavior evaluation method derived from environmental economy	
Lili Zhang, Xilin Hou, Fengru Xi	S136
Catalytic activities of zeolite compounds for decomposing aqueous ozone	
Ai KUSUDA, Mikito KITAYAMA, Yoshio OHTA	S141
Nitrogen and phosphorus removal in an airlift intermittent circulation membrane bioreactor	
Haiyan Guo, Jiandong Chen, Yun Li, Tengfeng Feng, Shoutong Zhang	S146
Electroreductive dechlorination of chlorophenols with Pd catalyst supported on solid electrode	
Caixia, Atsushi Matsunaga, Meguru Tezuka	S151
Quantitative analysis of microbial biomass yield in aerobic bioreactor	
Osamu Watanabe, Satoru Isoda	S155
Chemical constituents of <i>Prunella vulgaris</i>	
Xiaojie Gu, Youbin Li, Jun Mu, Yi Zhang	S161
Decolorization of oxygen-delignified bleaching effluent and biobleaching of oxygen-delignified kraft pulp	
by non-white-rot fungus <i>Geotrichum candidum</i> Dec 1	
Noboru Shintani, Makoto Shoda	S164
Overexpression of NADH oxidase gene from <i>Deinococcus geothermalis</i> in <i>Escherichia coli</i>	
Sase Kazuya, Iwasaki Tomomi, Karasaki Hatsune, Ishikawa Masahide	S169
Modeling the current-voltage characteristics of thin-film silicon solar cells based on photo-induced electron transfer processes	
Satoru Isoda	S172
Degradation of monofluorophenols in water irradiated with gaseous plasma	
Haiming Yang, Giya Mengen, Yuki Matsumoto, Meguru Tezuka	S180
Research on the evolvement of morphology of coking coal during the coking process	
Xiangyun Zhong, Shiyong Wu, Yang Liu, Zhenning Zhao, Yaru Zhang, Jinfeng Bai, Jun Xu, Bai Xi	S186
Effects of atamp-charging coke making on strength and high temperature thermal properties of coke	
Yaru Zhang, Jinfeng Bai, Jun Xu, Xiangyun Zhong, Zhenning Zhao, Hongchun Liu	S190
Enriching blast furnace gas by removing carbon dioxide	
Chongmin Zhang, Zhimin Sun, Shuwen Chen, Baohai Wang	S196
Removement of thiocyanate from industrial wastewater by microwave-Fenton oxidation method	
Bai Xi, Qingzhong Shi	S201
Effect of bulk density of coking coal on swelling pressure	
Jinfeng Bai, Chunwang Yang, Zhenning Zhao, Xiangyun Zhong, Yaru Zhang, Jun Xu, Bai Xi, Hongchun Liu	S205



Determination of thiocyanate in the vacuum carbonate desulfurization wastewater

Luyuan Wang, Lin Dong*, Wenhui Song

School of Chemical Engineering, University of Science and Technology Liaoning, Anshan 114051, China

Abstract

In acidic solution, thiocyanate molecules reacted with ferric ions to produce red complexes. The concentration of thiocyanate could be determined by spectrophotometer. The effects of wavelength, volume of color reagent, acidity and color time on absorbance were investigated. The interferences of co-existing ion were discussed as well. Results showed that the relation between absorbance and the concentration of thiocyanate was in accord with Beer's law when the concentration of thiocyanate was 2–20 mg/L. The linear regression equation was $\text{Absorbance} = 0.0523\text{Concentration} - 0.0156$, with a linear correlation coefficient of 0.9997. The average recovery rates of two kinds of vacuum carbonate desulfurization wastewater were 100.95% and 99.62%, and relative standard deviations were 0.79% and 0.14% respectively. It shows that the method was quick, high precision, accurate and easy to handle.

Key words: thiocyanate; spectrophotometry; desulfurization wastewater

Introduction

Vacuum carbonate gas desulfurization process directly uses the carbonate solution to absorb H_2S and HCN gas. In the coking process, about 30%–50% of the sulfur in the raw coal is converted into H_2S and other sulfide forms the gas impurities together with NH_3 and HCN. The concentration of H_2S is 5–8 mg/L (Wakker et al., 1993). H_2S has strong causticity and toxicity, and could be very harmful to environment if the volume in the air reaches 0.1%. Vacuum carbonate gas desulfurization process will produce a small amount of wastewater. The main components are K_2CO_3 , KHCO_3 , KCN, $\text{K}_4[\text{Fe}(\text{CN})_6]$, K_2SO_3 , $\text{K}_2\text{S}_2\text{O}_3$, and so on. High toxicity of cyanide causes the wastewater difficult to achieve the national emission standards. The studies of the wastewater containing cyanide began early, and many practical experiences were obtained (Monser and Ahdoum, 2002; White et al., 2000; Pagar et al., 2003; Heming et al., 1985).

Thiocyanate accounts for a certain proportion of the vacuum carbonate desulfurization wastewater. But we have yet to find the report about the determination of thiocyanate in the vacuum carbonate desulfurization wastewater.

1 Materials and methods

1.1 Reagents and instruments

Potassium thiocyanate standard solution (1 g/L) was used in all experiments. The ferric nitrate solution (50 g/L) was prepared as chromogenic agent. Sodium hydroxide and hydrochloric solutions were used to adjust pH. The solution of potassium carbonate, potassium bicarbonate, sodium thiosulfate, sodium sulfite, potassium ferricyanide, potassium ferrocyanide, and potassium cyanide were applied in the experiments and all solutions have concentration 6 g/L. Unless specific indication, the above reagents were analytic grade. The water used in the experiment was double distilled water. Solution was freshly made before use.

The instruments used in the experiments are: GR-202 electronic analytical balance (Shanghai Precision Science Instrument Co., Ltd., China), KQ-250DB CNC ultrasonic cleaner (Kunshan Ultrasonic Instrument Co., Ltd., China), T6 UV-Vis spectrophotometer (Beijing Purkinje General Instrument Co., Ltd., China), DL-1 heating furnace (Tianjin Taisite Instrument Co., Ltd., China), and pH meter (Shanghai Precision Science Instrument Co., Ltd., China).

1.2 Experimental methods

The determination of thiocyanate in the vacuum carbonate desulfurization wastewater was studied by spectrophotometry. In acidic solution, thiocyanate molecules reacted with

* Corresponding author. E-mail: dong_lin@163.com

ferric ions to produce red complexes. Known concentration thiocyanate standard working solution was analyzed when the experimental methods were established, and ferric nitrate solution was used as colour-display reagent.

To avoid the effects of interference ions, potassium thiocyanate standard solution was measured first to determine the optimal measurement conditions. Then the interference ions (CO_3^{2-} , HCO_3^- , CN^- , SO_3^{2-} , $\text{S}_2\text{O}_3^{2-}$, $\text{Fe}(\text{CN})_6^{4-}$) were removed from desulfurization wastewater. Under the optimal conditions a standard working curve was established. Finally, the concentration of potassium thiocyanate in actual samples was determined by standard working curve method. The precision and accuracy of method were examined.

1.3 UV-Visible spectrophotometry

In instrumental analysis, UV-Visible spectrophotometry has a long history. It makes use of light absorption of molecules or ions in a certain wavelength range. When a bunch of parallel monochromatic light passes through a dilute solution, the absorbance is proportional to the concentration of solution and the thickness of the liquid layer (Roberts and Wilson, 1968). Lambert-Beer law is the theoretical basis of UV-Visible spectrophotometry. UV-Visible absorption spectrum is mainly used for quantitative analysis of the substances, purity identification and structural analysis.

2 Results and discussion

2.1 Absorption spectrum

Put 5 mL 100 mg/L standard potassium thiocyanate solution to 50 mL volumetric flask under acidic conditions and use 5 mL 50 g/L ferric nitrate solution as visualization reagent. Measure the absorbance with cuvette of 1 cm, kept blank solution sample as reference, in the 200–800 nm range, measured once every 10 nm. The spectrum (Fig. 1) shows that 440 nm is the best wavelength.

2.2 Influence of acidity

The impact of pH on the absorbance was also determined. As shown in the Fig. 2, within the pH range of 1–4, the

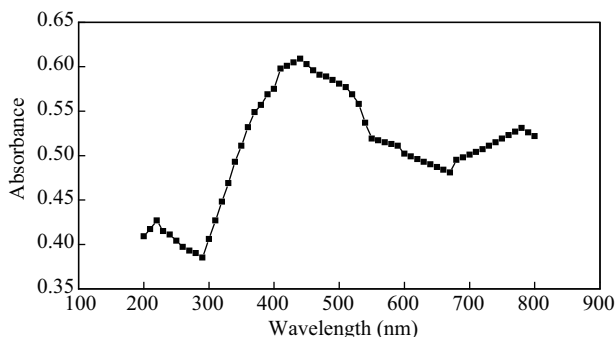


Fig. 1 Absorption spectrum.

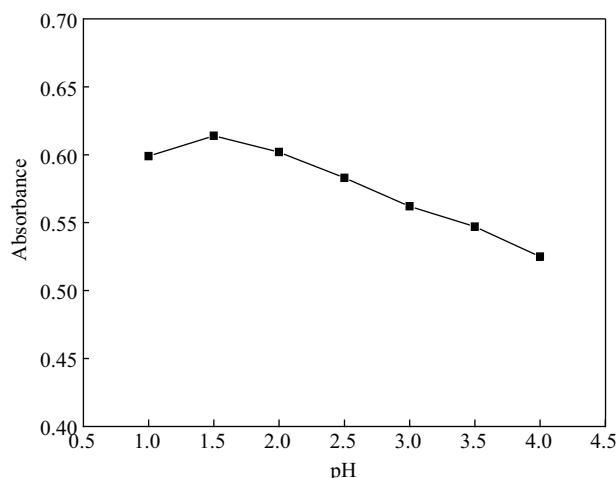


Fig. 2 Influence of pH on the absorbance.

maximum absorbance value at pH = 1.5. Therefore, adjust pH to 1.5.

2.3 Color time of the system

The effects of reaction time were investigated (Fig. 3). The results showed that the response achieve to balance at room temperature from 10–20 min, therefore, 15 min was chose as the best color time.

2.4 Impact of the volume of ferric nitrate

Experimental results showed that when 5 mL 50 g/L ferric nitrate solution was used, the absorbance value was maximum (Fig. 4). Therefore, 5 mL color reagent was used to all other experiments.

2.5 Impact of the hybrid ions

In accordance with the experimental methods, interference experiments were performed with the following ions: CO_3^{2-} , HCO_3^- , CN^- , SO_3^{2-} , $\text{S}_2\text{O}_3^{2-}$ and $\text{Fe}(\text{CN})_6^{4-}$. As can be seen from the experiment, potassium cyanide, potassium carbonate and potassium bicarbonate had weak effect on the absorbance of standard working solution. Sodium sulfite and sodium thiosulfate had a negative impact on the absorbance of standard working solution. Potassium ferrocyanide in 10 times had a greater influence to standard working solution.

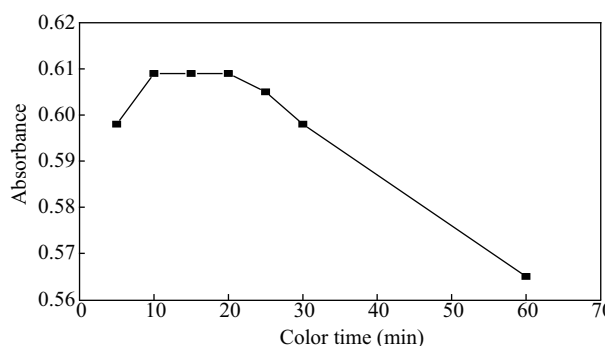


Fig. 3 Influence of color time

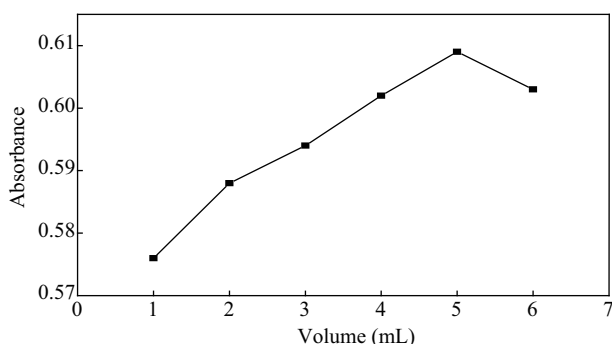


Fig. 4 Influence of color reagent volume.

However, considering the actual sample, the concentration of potassium ferrocyanide were less than 10 times of the standard working solution instead of 1–2 times actually. So 3 times potassium ferrocyanide were used to examine the actual samples. By the results showed, potassium ferrocyanide in the actual samples had almost no impact on the measurement of thiocyanate. Sodium sulfite, sodium thiosulfate, potassium carbonate, potassium bicarbonate and other miscellaneous ions can be excluded by acid boiling method. By adding these hybrid ions, adjusting the pH, heating to boiling, filtering, the similar absorbance was received as the standard working solution. Due to limited space, only three kinds of interfering component, potassium carbonate, potassium bicarbonate and potassium cyanide were selected as the example to explain the experimental results (Fig. 5).

When the amount of potassium thiocyanate was 0.01 g/L and allowable error is $\pm 5\%$, CO_3^{2-} , HCO_3^- , CN^- , SO_3^{2-} , $\text{S}_2\text{O}_3^{2-}$ and $\text{Fe}(\text{CN})_6^{4-}$ were added to the multiples 1, 10, 50, 100 respectively. Comparative experiments showed that first five kinds of interfering ion under 50 times and last one under 3 times, the impact was negligible.

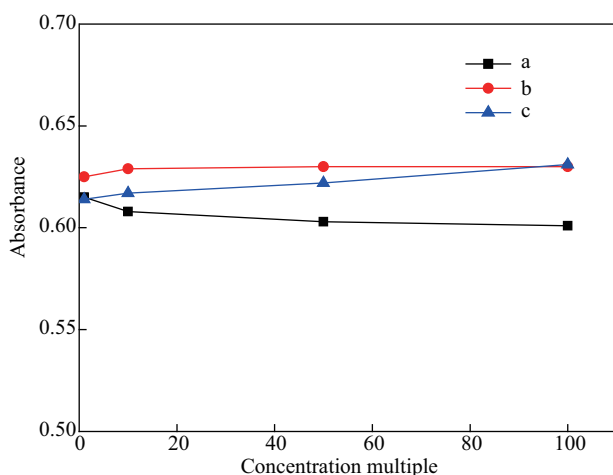


Fig. 5 Curve of potassium carbonate (line a), potassium bicarbonate (line b) and potassium cyanide (line c) and absorbance.

2.6 Standard working curve

Under optimal conditions, in accord with the experimental method, the standard working curve of potassium thiocyanate was established (Fig. 6). When the concentration of potassium thiocyanate was 2–20 mg/L, the concentration showed a good linear relationship with absorbance. Linear regression equation was $\text{Absorbance} = 0.0523\text{Concentration} - 0.0156$, with related coefficient $R = 0.9997$. The apparent molar absorptivity was $5.1 \times 10^3 \text{ L}/(\text{mol}\cdot\text{cm})$.

2.7 Analysis of analog samples

Before analyzing actual samples, analog barren liquor and condensate were prepared to test experimental method. With the method established in this article, the concentrations of potassium thiocyanate of these analog samples were determined. As shown in Table 1, the precision of the method is good for the analog samples.

2.8 Determination of thiocyanate in the actual barren liquor

With the proposed method, the concentrations of potassium thiocyanate of actual vacuum carbonate desulfurization wastewater were determined. The concentration of potassium thiocyanate in the barren liquor was 1.98 g/L ($n = 5$, $\text{RSD} = 0.79\%$). In order to measure accuracy, the barren liquor was diluted 200 times. As can be seen in Table 2, the developed method has good recoveries for the actual barren liquor.

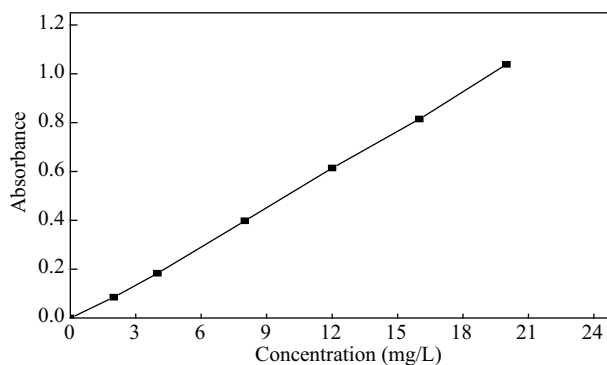


Fig. 6 Standard working curve.

Table 1 Component of simulating reagents and test results

Samples	Barren liquor	Condensate
K_2CO_3 (g/L)	68	1
KHCO_3 (g/L)	7	1
$\text{Na}_2\text{S}_2\text{O}_3$ (g/L)	2	1
KCN (g/L)	10	4
$\text{K}_4[\text{Fe}(\text{CN})_6]$ (g/L)	2	2
KSCN (g/L)	8	10
Measured value (g/L)	7.80	10.13
Error (%)	2.50	1.30

Table 2 Analytical results of actual barren liquor and actual condensate

Concentration (mg/L)	Adding concentration (mg/L)	Theoretical concentration (mg/L)	Actual concentration (mg/L)	Recovery (%)	Average recovery rate (%)
Actual barren liquor					
9.88	2	11.88	12.06	101.52	100.95
9.88	4	13.88	13.69	98.63	
9.88	8	17.88	18.67	104.44	
9.88	12	21.88	22.45	102.61	
9.88	16	25.88	25.25	97.57	
Actual condensate					
10.18	2	12.18	12.51	102.71	99.62
10.18	4	14.18	13.96	98.45	
10.18	8	18.18	18.90	103.96	
10.18	12	22.18	21.21	95.63	
10.18	16	26.18	25.49	97.36	

2.9 Determination of thiocyanate in the actual condensate

Using the established method, the concentrations of potassium thiocyanate of actual vacuum carbonate desulfurization wastewater were determined. The concentration of potassium thiocyanate in the condensate was 10.18 g/L ($n = 5$, RSD = 0.14%). In order to measure accuracy, the condensate was diluted 1000 times. From **Table 2**, it can be seen that this method has good recoveries for the actual condensate.

3 Conclusions

A method to determine the concentration of thiocyanate in the vacuum carbonate desulfurization wastewater was established. When the color time was 15 min, the volume of color reagent was 5 mL, pH was 1.5, absorption wavelength was 440 nm, the conditions achieved optimal. Results showed that miscellaneous ions had little effect on the determination. Under the optimum experimental conditions, a standard working curve was established. The relation between absorbance and potassium thiocyanate was linear when concentration of potassium thiocyanate was 2–20 mg/L. The equation of linear regression was $\text{Absorbance} = 0.0523\text{Concentration} - 0.0156$ with a linear correlation coefficient of 0.9994. This method was used to determine potassium thiocyanate in the two kinds of vacuum carbonate desulfurization wastewater. The recovery rate reached to 95.63%–104.44%. The relative standard deviation was 0.14% and 0.79%. The results showed the

precision and accuracy of this method were satisfactory, and the method was simple and practical.

Acknowledgments

The authors express their appreciation to ACRE Coking and Refractory Engineering Consulting Corporation, MCC for financial support. Many thanks to Jinfeng Bai for support and assistance. The helpful discussions with Jun Xu, Bai Xi are gratefully acknowledged.

References

- Heming T A, Thurston R V, Meyn E L, Zajdel R K, 1985. Acute toxicity of thiocyanate to trout. *Transactions of the American Fisheries Society*, 114(6): 895–905.
- Monser L, Ahdoum N, 2002. Modified activated carbon for the removal of copper, zinc, chromium and cyanide from wastewater. *Separation and Purification Technology*, 26(2-3): 137–146.
- Pagar J R, Shukla S S, Carrillo-Pedroza F R, 2003. Destruction of cyanide waste solutions using chlorine dioxide, ozone and titania sol. *Waste Management*, 23: 183–191.
- Roberts R F, Wilson R H, 1968. The determination of ferrocyanide and related compounds in commercial sodium chloride. *Analyst*, 93: 237–243.
- Wakker J P, Gerritsen A W, Moulijin J A, 1993. High temperature hydrogen sulfide and carbonyl sulfide removal with manganese oxide (MnO) and iron oxide (FeO) on gamma-alumina acceptors. *Industrial & Engineering Chemistry Research*, 32(1): 139–149.
- White D M, Pilon T A, Woolard C, 2000. Biological treatment of cyanide containing wastewater. *Water Research*, 34(7): 2105–2109.

Editorial Board of Journal of Environmental Sciences

Editor-in-Chief

Hongxiao Tang Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences, China

Associate Editors-in-Chief

Jiuhui Qu Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences, China

Shu Tao Peking University, China

Nigel Bell Imperial College London, United Kingdom

Po-Keung Wong The Chinese University of Hong Kong, Hong Kong, China

Editorial Board

Aquatic environment

Baoyu Gao

Shandong University, China

Maohong Fan

University of Wyoming, USA

Chihpin Huang

National Chiao Tung University

Taiwan, China

Ng Wun Jern

Nanyang Environment &

Water Research Institute, Singapore

Clark C. K. Liu

University of Hawaii at Manoa, USA

Hokyong Shon

University of Technology, Sydney, Australia

Zijian Wang

Research Center for Eco-Environmental Sciences,

Chinese Academy of Sciences, China

Zhiwu Wang

The Ohio State University, USA

Yuxiang Wang

Queen's University, Canada

Min Yang

Research Center for Eco-Environmental Sciences,

Chinese Academy of Sciences, China

Zhifeng Yang

Beijing Normal University, China

Han-Qing Yu

University of Science & Technology of China

Terrestrial environment

Christopher Anderson

Massey University, New Zealand

Zucong Cai

Nanjing Normal University, China

Xinbin Feng

Institute of Geochemistry,

Chinese Academy of Sciences, China

Hongqing Hu

Huazhong Agricultural University, China

Kin-Che Lam

The Chinese University of Hong Kong

Hong Kong, China

Erwin Klumpp

Research Centre Juelich, Agrosphere Institute

Germany

Peijun Li

Institute of Applied Ecology,

Chinese Academy of Sciences, China

Michael Schloter

German Research Center for Environmental Health

Germany

Xuejun Wang

Peking University, China

Lizhong Zhu

Zhejiang University, China

Atmospheric environment

Jianmin Chen

Fudan University, China

Abdelwahid Mellouki

Centre National de la Recherche Scientifique

France

Yujing Mu

Research Center for Eco-Environmental Sciences,

Chinese Academy of Sciences, China

Min Shao

Peking University, China

James Jay Schauer

University of Wisconsin-Madison, USA

Yuesi Wang

Institute of Atmospheric Physics,

Chinese Academy of Sciences, China

Xin Yang

University of Cambridge, UK

Environmental biology

Yong Cai

Florida International University, USA

Henner Hollert

RWTH Aachen University, Germany

Jaе-Seong Lee

Hanyang University, South Korea

Christopher Rensing

University of Copenhagen, Denmark

Bojan Sedmak

National Institute of Biology, Ljubljana

Lirong Song

Institute of Hydrobiology,

the Chinese Academy of Sciences, China

Chunxia Wang

National Natural Science Foundation of China

Gehong Wei

Northwest A & F University, China

Daqiang Yin

Tongji University, China

Zhongtang Yu

The Ohio State University, USA

Environmental toxicology and health

Jingwen Chen

Dalian University of Technology, China

Jianying Hu

Peking University, China

Guibin Jiang

Research Center for Eco-Environmental Sciences,

Chinese Academy of Sciences, China

Sijin Liu

Research Center for Eco-Environmental Sciences,

Chinese Academy of Sciences, China

Tsuyoshi Nakanishi

Gifu Pharmaceutical University, Japan

Willie Peijnenburg

University of Leiden, The Netherlands

Bingsheng Zhou

Institute of Hydrobiology,

Chinese Academy of Sciences, China

Environmental catalysis and materials

Hong He

Research Center for Eco-Environmental Sciences,

Chinese Academy of Sciences, China

Junhua Li

Tsinghua University, China

Wenfeng Shangguan

Shanghai Jiao Tong University, China

Yasutake Teraoka

Kyushu University, Japan

Ralph T. Yang

University of Michigan, USA

Environmental analysis and method

Zongwei Cai

Hong Kong Baptist University,

Hong Kong, China

Jiping Chen

Dalian Institute of Chemical Physics,

Chinese Academy of Sciences, China

Minghui Zheng

Research Center for Eco-Environmental Sciences,

Chinese Academy of Sciences, China

Municipal solid waste and green chemistry

Pinjing He

Tongji University, China

Environmental ecology

Rusong Wang

Research Center for Eco-Environmental Sciences,

Chinese Academy of Sciences, China

Editorial office staff

Managing editor Qingcai Feng

Editors Zixuan Wang Suqin Liu Zhengang Mao

English editor Catherine Rice (USA)

JOURNAL OF ENVIRONMENTAL SCIENCES

环境科学学报(英文版)
(<http://www.jesc.ac.cn>)

Aims and scope

Journal of Environmental Sciences is an international academic journal supervised by Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences. The journal publishes original, peer-reviewed innovative research and valuable findings in environmental sciences. The types of articles published are research article, critical review, rapid communications, and special issues.

The scope of the journal embraces the treatment processes for natural groundwater, municipal, agricultural and industrial water and wastewaters; physical and chemical methods for limitation of pollutants emission into the atmospheric environment; chemical and biological and phytoremediation of contaminated soil; fate and transport of pollutants in environments; toxicological effects of terrorist chemical release on the natural environment and human health; development of environmental catalysts and materials.

For subscription to electronic edition

Elsevier is responsible for subscription of the journal. Please subscribe to the journal via <http://www.elsevier.com/locate/jes>.

For subscription to print edition

China: Please contact the customer service, Science Press, 16 Donghuangchenggen North Street, Beijing 100717, China. Tel: +86-10-64017032; E-mail: journal@mail.sciencep.com, or the local post office throughout China (domestic postcode: 2-580).

Outside China: Please order the journal from the Elsevier Customer Service Department at the Regional Sales Office nearest you.

Submission declaration

Submission of an article implies that the work described has not been published previously (except in the form of an abstract or as part of a published lecture or academic thesis), that it is not under consideration for publication elsewhere. The submission should be approved by all authors and tacitly or explicitly by the responsible authorities where the work was carried out. If the manuscript accepted, it will not be published elsewhere in the same form, in English or in any other language, including electronically without the written consent of the copyright-holder.

Submission declaration

Submission of the work described has not been published previously (except in the form of an abstract or as part of a published lecture or academic thesis), that it is not under consideration for publication elsewhere. The publication should be approved by all authors and tacitly or explicitly by the responsible authorities where the work was carried out. If the manuscript accepted, it will not be published elsewhere in the same form, in English or in any other language, including electronically without the written consent of the copyright-holder.

Editorial

Authors should submit manuscript online at <http://www.jesc.ac.cn>. In case of queries, please contact editorial office, Tel: +86-10-62920553, E-mail: jesc@263.net, jesc@rcees.ac.cn. Instruction to authors is available at <http://www.jesc.ac.cn>.

Journal of Environmental Sciences (Established in 1989)

Vol. 25 Supplement 2013

Supervised by	Chinese Academy of Sciences	Published by	Science Press, Beijing, China
Sponsored by	Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences		Elsevier Limited, The Netherlands
Edited by	Editorial Office of Journal of Environmental Sciences P. O. Box 2871, Beijing 100085, China Tel: 86-10-62920553; http://www.jesc.ac.cn E-mail: jesc@263.net , jesc@rcees.ac.cn	Distributed by	Domestic Science Press, 16 Donghuangchenggen North Street, Beijing 100717, China Local Post Offices through China Foreign Elsevier Limited http://www.elsevier.com/locate/jes
Editor-in-chief	Hongxiao Tang	Printed by	Beijing Beilin Printing House, 100083, China
CN 11-2629/X	Domestic postcode: 2-580		Domestic price per issue RMB ¥ 110.00

ISSN 1001-0742

