以化學方法活化廢污泥製備吸附劑對雙成分染料之吸附特性的研究

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摘 要

在處理染料廢水的方法中，利用吸附程序是有效的處理方法之一。利用廢棄物研製成吸附劑，可以降低處理成本。本研究以活性碳與廢污泥所研製的吸附劑，不同活化劑製備成的吸附劑及不同初始濃度(20~100ppm)的條件下，對於單獨存在與雙成分染料(AR4、AR27、MG與RB5)溶液的吸附行為進行研究，並探討其吸附平衡與動力之間的關係。

結果研究顯示，以活性碳與自製吸附劑吸附雙成份染料MG+AR27與RB5+AR4，吸附動力式皆以Pseudo-second-order equation的符合情形最佳。單成份染料及雙成份染料的等溫吸附模式，皆以Langmuir adsorption isotherm來描述最佳，且利用單成份Langmuir adsorption isotherm的常數值可推算出雙成份的吸附值。實驗結果發現以利用ZnCl2+H2SO4當活化劑之吸附劑吸附效果最好。

關鍵詞 : 廢污泥、活化劑、吸附動力式、Langmuir等溫吸附模式、染料

目錄

參考文獻

?王俊傑，「KOH活化法裂解都市下水污泥生成吸附劑之研究」，碩 士論文，國立中央大學，桃園，民國97 年12 月。?林文超，「廢棄活性白土對水溶液中染料之吸附特性研究」，碩士論文，私立義守大學，高雄，民國94 年1 月。?張心翰、林欣怡，「廢污泥研製吸附劑對於染料RR141的吸附行為研究」，專題研究報告，私立大葉大學環境工程學系，彰化，民國92年6月。?黃理御、洪振?、陳正彬，「廢污泥研製吸附劑對染料Acid Red 4吸附行為之研究」，專題研究報告，私立大葉大學環境工程學系，彰化，民國93年6月。?黃郁珊、陳思潔、方芊涵、徐紹展，「以廢污泥研製吸附劑對於染料溶液的吸附能力之研究」，專題研究報告，私立大葉大學環境工程學系，彰化，民國95年6月。?彭詠綺、譚仁豪、林珮茹，「廢污泥研製吸附劑對雙成份染料溶液的吸附行為研究」，專題研究報告，私立大葉大學環境工程學系，彰化，民國93年1月。?蔡安東，「化學活化法製備孟宗竹活性碳製程之研究」，碩士論文國?雲?科技大學，雲林，民國96 年7 月。?潘毅峰，「再生廢白土對染料及重金屬之競爭吸附行為研究」，碩士論文，私立義守大學，高雄，民國95 年7 月。?謝辰芳、吳欣樺、江政穎、陳美芳、詹又寧，「廢污泥研製吸附劑對於染料Acid Red 27的吸附行為研究」，專題研究報告，私立大葉大學環境工程學系，彰化，民國93年6月。?謝國鎔，「廢矽藻土活化再生為多孔性材料」，碩士論文，嘉南藥理科技大學，台南，民國92年。?蕭俊弘，「以自製吸附劑吸附雙成份染料與其光催化特性之研究」，碩士論文，私立大葉大學環境工程學系，彰化，民國96 年 6 月。?Al-Degs,Y., Khraisheh, M. A. M., Allen, S. J., Ahma, M. N.,Walker, G.. M.,“ Competitive adsorption of reactive dyes from solution: Equilibrium isotherm studies insingle and multisolute systems ”, Chemical Engineering Journal , Vol.128, pp.163-167, 2007.?Allen, S. J., Mckay, G., Porter J. F.,“ Adsorption isotherm models for basic dye adsorption by peat in single and binary component systems ”, Journal of Colloid and Interface Science, Vol.280, pp.322-333, 2004.?Basar ,C. A.,“ Applicability of the various adsorption models of three dyes adsorption onto activated carbon prepared waste apricot ”, Journal of Hazardous Materials, Vol.B135, pp.232-241, 2006.?Cay, S., Uyan?k, A., Ozasik, A.,“ Single and binary component adsorption of copper(II) and cadmium(II) from aqueous solutions using tea-industry waste ”, Separation and Purification Technology, Vol.38, pp.273-280, 2004.?Chan, L. S., Cheung, W. H., McKay,G.,“ Adsorption of acid dyes by bamboo derived activated carbon ”, Desalination, Vol.218, pp.304-312, 2008.?Chiang, H. L., Lin, K. H., Chen, S.Y., Choa, C. G., Pan, S. D.,“ Dye adsorption on biosolid adsorbents and commercially activated carbon ”, Dyes and Pigments, Vol.75, pp.52-59, 2007.?Chiou, M. S., Chuang,G. S.,“ Competitive adsorption of dye metanil yellow and RB15 in acid solutions on chemically cross-linked chitosan beads ”, Chemosphere, Vol.62, pp.731-740, 2006.?Chiou, M. S., Ho, P. Y., Li, H. Y.,“ Adsorption behavior of dye AAVN and RB4 inAcid solutions on chemically cross-linked chitosan beads ”, Chem. Engrs, Vol.34, pp.625-634, 2003.?Choy, K. K. H., Porter,J.F., Mckay, G.,“ Intraparticle diffusion in single and multicomponent acid dye adsorption from wastewater onto carbon ”, Chemical Engineering Journal, Vol.103, pp.133-145, 2004.?Din, A. T. M., Hameed, B. H., Ahmad, A. L.,“ Batch adsorption of phenol onto physiochemical-activated coconut shell ”, Journal of Hazardous Materials, Vol.161, pp.1522-1529, 2009.?Ip, A. W. M., Barford, J. P., McKay, G.,“ Production and comparison of high surface area bamboo derived active carbons ”, Bioresource Technology, Vol.99, pp.8909-8916, 2008.?Ismadji, S., Sudaryanto, Y., Hartono, S. B., Setiawan, L. E. K., Ayucitra, A.,“ Activated carbon from char obtained from vacuum pyrolysis of teak sawdust: pore structure development and characterization ”, Bioresource Technology ,Vol.96, pp.1364-1369, 2005.?Malik, P. K.,“ Dye removal from wastewater using activated carbon developed from sawdust: adsorption equilibrium and kinetics ”, Journal of Hazardous Materials, Vol.113, pp.81-83, 2004.?Machida, M., Aikawa, M., Tatsumoto, H.,“ Prediction of simultaneous adsorption of Cu(II) and Pb(II) onto activated carbon by conventional Langmuir type equations ”, Journal of Hazardous Materials,Vol.120, pp.271-275, 2005.?Namane, A., Mekarzia, A., Benrachedi, K., Belhaneche-Bensemra, N., Hellal A.,“ Determination of adsorption capacity of activated carbon made from coffee grounds by chemical activation with ZnCl2 and H3PO4 ”, Journal of Hazardous Materials, Vol.B119, pp.189-194, 2005.?Nowicki, P., Pietrzak, R., Wachowska, H.,“ Siberian anthracite as a precursor material for

microporous activated carbons ” , Fuel, Vol.87, pp.2037-2040, 2008.?Prahas, Devarly., Kartika, Y., Indraswati, N., Ismadji, S., “ Activated carbon from jackfruit peel waste by H3PO4 hemical ctivation:Pore structure and surface chemistry characterization ” , Chemical Engineering Journal , Vol.140, pp.32-34, 2008.?Qin, F., Wen, B., Shan, X. Q., Xie, Y. N., Liu, T., Zhang, S. Z., Khan, U., “ Mechanisms of competitive adsorption of Pb, Cu, and Cd on peat ” , Environmental Pollution, Vol.144, pp.669-680, 2006.?Ros, A., M, A., Lillo-Rodenas, M. A., Fuente, E., Montes-Moran, M.A., Martin, M. J., Linares-Solano, A “ High surface area materials prepared from sewage sludge-based precursors ” , Chemosphere, Vol.65, pp.132-140, 2006.?Rozada, F., Otero, M., Parra, J. B., Moran, A., Garcia, A. I., “ Producing adsorbents from sewage sludge and discarded tyres Characterization and utilization for the removal of pollutants from water ” , Chemical Engineering Journal, Vol.114, pp.161-169, 2005.?Sudaryanto, Y., Hartono, S. B., Irawaty, W., Hindarso, H., Ismadji, S., “ High surface area activated carbon prepared from cassava peel by chemical activation ” , Bioresource Technology, Vol.97, pp.734-739, 2006.?Srivastava, V. C., Mall, I. D., Mishra, I. M., “ Equilibrium modelling of single and binary adsorption of cadmium and nickel onto bagasse fly ash ” , Chemical Engineering Journal, Vol.117, pp.79-91, 2006.?Turabik, M., “ Adsorption of basic dyes from single and binary component systems onto bentonite: Simultaneous analysis of Basic Red 46 and Basic Yellow 28 by first order derivative spectrophotometric analysis method ” , Journal of HazardousMaterials, Vol.158, pp.52-64, 2008.?Wang, X. W., Zhu, N., Yin, B., “ Preparation of sludge-based activated carbon and its application in dye wastewater treatment ” , Journal of Hazardous Materials, Vol.153, pp.22-27, 2008.?Wang, S., Ariyanto, E., “ Competitive adsorption of malachite green and Pb ions on natural zeolite ” , Journal of Colloid and Interface Science, Vol.314, pp.25-31, 2007.?Wu, F. C., Tseng, R. L., Juang, R. S., “ Preparation of highly microporous carbons from fir wood by KOH activation for adsorption of dyes and phenols from water ” Separation and Purification Technology, Vol.47, pp.10-19, 2005.?Yu, L., Zhong, Q., “ Preparation of adsorbents made from sewage sludges for adsorption of organic materials from wastewater ” , Journal of Hazardous Materials, Vol.137, pp.359-366, 2006.