

科目：455 水處理工程

系組：土木系

(本試題共一頁，第一頁)

考生注意：1. 依次序作答，只要標明題號，不必抄題。
2. 答案必須寫在答案卷上，否則不予計分。
3. 試題隨卷繳回。

- 一、 下面是一篇研究期刊論文之摘要與結論，假設是您進行此研究，請依此內容規劃一個研究實驗，能夠獲得與此內容相近之成果，並將實驗結果可能產生的數據圖表，以最適當的方式表現出，再依這些圖表說明您所規劃的實驗，可獲得哪些重要結果與討論。如果想進行此主題之延伸性相關研究，您認為應該如何進一步規劃研究實驗，才能獲得更深入的研究成果，請提出您的看法(請儘可能用英文回答本題答案) 60%

Abstract

This study aims to find news a die of purification for a wastewater reuse. Primary effluent contains organic mineral, dissolved and suspended matter (colloids). Microfiltration or ultrafiltration is adequate for producing disinfected clear water suited for different applications. However, direct filtration on membrane is limited by the fouling phenomena which leads during filtration to constant pressure, to a strong and continuous decrease of the permeate flux. On the other hand, coagulation and adsorption make it possible to removal the colloidal fraction, which plays a significant role in membrane fouling. We considered the treatment of primary effluent by coagulation-adsorption-ultrafiltration for reuse with ultrafiltration membranes. Tests have been performed on the primary effluent of the wastewater treatment plant of Staoueli, Algeria with the average characteristics in the chemical oxygen demand (COD) of 165 mg of O_2/L , and turbidity 90 NTU. The ultrafiltration tests have been made on mineral membranes tubular CARBOSEP M5 (10 kDa), M2 (15 kDa), in dynamic mode with a transmembrane pressure $\Delta P = 1$ bar, cross flow velocity $U = 3$ m/s. The reagents used $FeCl_3$ (as a coagulant agent) and powder activated carbon (PAC) as an adsorbent agent. In the first step, the optimal conditions were determined for coagulation and adsorption corresponding to the best elimination of turbidity as well as organic matter. In the second step, the efficiency of different processes (coagulation, adsorption, ultrafiltration) was compared when used alone or combined. The coagulation test showed a COD value equal to 23 mg/l at pH = 5.5 for $FeCl_3$, concentration 120 mg/l and a final turbidity equal to 12 NTU. For the process coagulation-adsorption-ultrafiltration, we obtained the best COD final value of 7 mg/l. The best value of the permeate was obtained for the coupling coagulation-ultrafiltration at coagulant concentration equal to 80 mg/l and residual COD equal to 13 mg/l for M2 membrane. Coagulation significantly improves the ultrafiltration performances. The coupling makes it possible to reduce the regeneration membranes.

Conclusions

The study made it possible to determine the optimal primary conditions by coagulation for effluent with pH = 5.5 and one concentration in coagulant $C = 120$ mg/l. Coagulation improves the permeate flux in a very significant way. The coupling makes it possible to modify the configuration of the deposit on the surface of the membrane by the formation of larger particles of greater dimensions (flocs). It permits too the reduction of membrane regeneration. We observed a significant reduction of COD, which decreases on average from 165 to 40 mg/l under jar test; 20 mg/l under the test of coupling coagulation or adsorption ultrafiltration; 7 mg/l under the test of combining coagulation-adsorption-ultrafiltration. We observed partial or total elimination of turbidity, according to cases, which decreases from 90 to 13.5 NTU under jar test, with 0 NTU under the test of coupling coagulation or adsorption ultrafiltration like under the test of a combination. Such a quality of water makes it possible to consider its reuse as industrial water.

- 二、 請詳細並舉例說明現今全世界二大發展重點科技---奈米技術與分子生物技術，在環境工程上之應用。40%