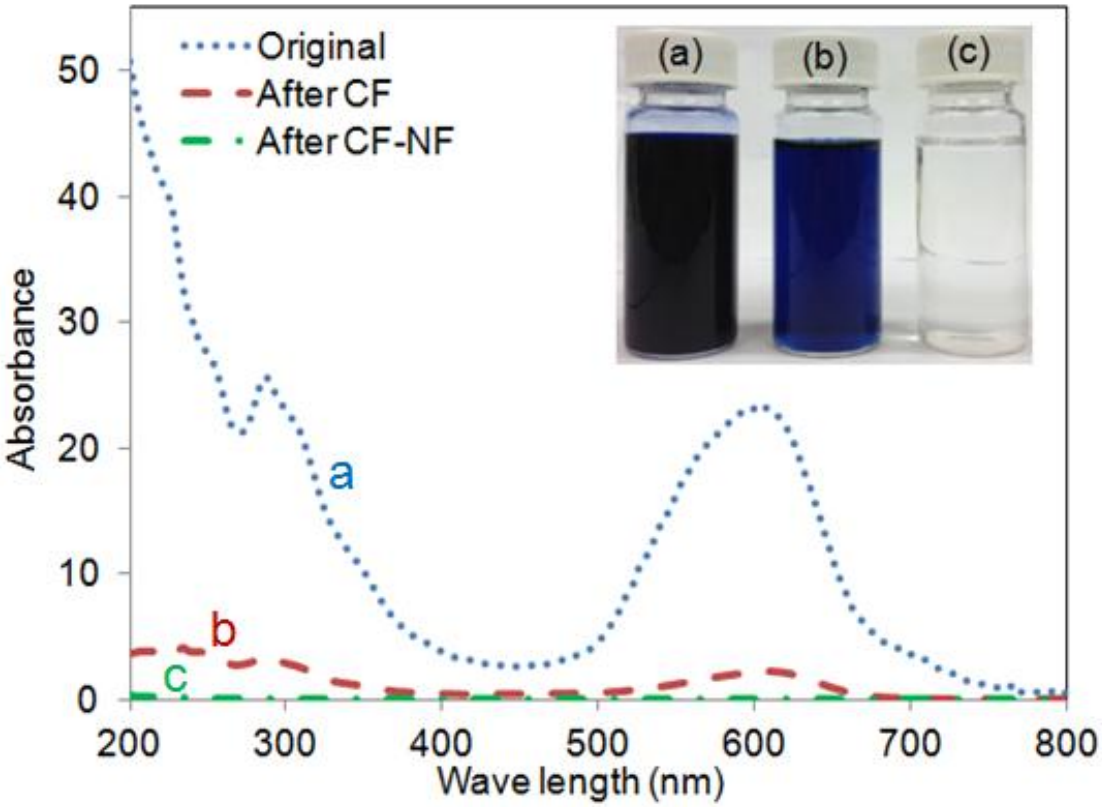
The treatment of highly concentrated wastewater consisting of two reactive dyes, two acid dyes and one basic dye was studied by individual coagulation/flocculation (CF) and nanofiltration (NF) processes as well as their combination (referred as CF-NF). Polyaluminum chloride (PAC) and polydiallyldimethyl ammonium chloride (PDDA) were screened out and selected as the most effective coagulant and flocculant, respectively. It is found that the CF process are favorable for highly concentrated dye solutions with pH values large than 3. It can achieve about 90% of dye removal at the optimal dosage of PAC/PDDA=400/200 ppm. A positively charged NF hollow fiber membrane was fabricated and used for NF treatment. It is able to remove almost 100% dyes with a permeate flux of about 1.0 $Lm^{-2}h^{-1}$ under an operating pressure of 1 bar. The combination of CF and NF can complement each other's strengths and overcome their individual limitations. The NF treatment can completely remove the strong color left in CF treated dye solutions, while the efficiency of coagulant/flocculant is improved by treating NF concentrated streams and subsequently results in much less sludge. In addition, membrane fouling is abated and NF permeate flux is increased by applying the CF process as a pretreatment. Thus, combining CF and NF together improves the overall performance for wastewater treatment.


Original
After CF
After CF-NF
(a)
(b)
(c)
Absorbance
50
40
30
20
10
0
a
b
c
200
300
400
500
600
700
800
Wave length (nm)