Preparation of silk fibroin/chitosan film and its ability to remove Rhodamine B dye in aqueous solution

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Abstract: Water pollution is one of the major concerns recently because it created serious problems for water resources, thus a number of technologies have been explored to decolorize the dye molecules in wastewater. In practical application, physical absorption is one of the most simply, effective and economic methods for dye removal in wastewater. In this work, silk fibroin derived from silk cocoon waste was blended with chitosan from shrimp shell. The silk fibroin/chitosan films were prepared and then their adsorption potential was evaluated for removal of Rhodamine B dye in aqueous solution. The surface morphology and microstructure of composite film was investigated using scanning electron microscopy (SEM) and it was found that the films have smooth surfaces. The cross section image of composite film showed the homogeneity of film and the thickness of film is around 45 µm. The interactions between two components in the blend were determined by FTIR spectroscopy. There are the amide band shifts suggesting that the interaction between silk fibroin and chitosan which probably due to the interaction of hydrogen bonding. The thermal stability of adsorbent is measured using thermogravimetric analysis. The swelling test of composite film was carried out. The adsorption potential of silk fibroin/chitosan film was determined. Adsorption conditions such as chitosan content in the composite, initial concentration of dye, pH, adsorption isotherm, and adsorption kinetics were evaluated. The results show that silk fibroin/chitosan films have potential to remove dyes in wastewater.

Keywords: Silk fibroin; Chitosan; Dye removal; Biosorbent