Synthesis and Characterization of Superabsorbent Polymer (SAP) from Cottone Waste Cellulose

Edessa Violeta S. Tiongson [1], Carlota C. Canopin [1], Francis Marc Z. De Jesus [1], Ian Robert M. Higuit [1], Jerome Kirvy G. Jatillana[1], Errol N. Secapuri[1], Rugi Vicente C. Rubi[1] *

[1]Chemical Engineering Department, College of Engineering, Adamson University, 900 San Marcelino St. Ermita Manila, Philippines

ABSTRACT

Super absorbent polymer (SAP) is a class of polymers that absorb large quantity of water more than a typical absorbent material. Recently, research on the use of waste raw materials has extensively been studied. One particular waste material of interest is cotton waste which is known to be a good source of cellulose. In this study, a sustainable SAP from carboxymethylcellulose sodium (CMC) and extracted cellulose from cotton waste material at varying weight ratios of CMC to cellulose (7:3, 2:1, and 5:5) crosslinked with citric acid was proposed. The produced SAP samples were then characterized by Scanning Electron Microscopy (SEM) for morphological properties and Fourier Transform Infrared Spectroscopy (FTIR) analysis for the functional groups identification. In addition, swelling rate, absorptivity, and water retention were investigated to evaluate the performance of the prepared SAP. The SEM results showed that there is an increasing porosity of the surface of SAP as the concentration of CMC increases. FTIR results indicate that the cross-linking formation of the carboxylic group was visible at the band range from 1640-1600 cm^{-1} and the presence of OH^{-1} bond was found at the band range from 3500-3000 cm^{-1} which is essential in water absorption. For the swelling rate of the SAP samples, it took 45 to 50 minutes to reach swelling equilibrium while the maximum swelling capacity was found to be 68 and 55 g H_2O per g dry sample for 7:3 and 2:1 ratio of CMC-cellulose solution samples. Water retention results showed that 13.8 and 15.9% of water were lost respectively. The results of this study showed the potential of cotton-waste as a sustainable source of cellulose for the production of SAP.

Keywords: *Superabsorbent Polymer, Carboxymethylcellulose, Cotton waste, Cellulose, Crosslinking*