



Effects of cellulase enzyme and nonionic surfactant on deinking of xerographic and laser-printed paper

Pravitra Chandranupap^{1*}, Kulsaya Somsri², and Panitnad Chandranupap²

¹*Department of Industrial Chemistry, Faculty of Applied Science,
King Mongkut's University of Technology North Bangkok, Thailand*

²*Department of Chemical Engineering, Faculty of Engineering,
King Mongkut's University of Technology North Bangkok, Thailand*

*e-mail: pravitra.c@sci.kmutnb.ac.th

Effects of cellulase enzyme and nonionic surfactant (Triton X-100) onto recycled xerographic and laser-printed papers' properties were investigated. The studied factors were flotation conditions, enzyme and surfactant dosages in the range of 0 wt% - 0.15 wt% and 0 wt% - 1.2 wt% (based on oven-dried pulp), respectively. Pulp slurry of 5% consistency was used for enzyme treatment and the slurry was diluted to 0.5% consistency before flotation. The synergetic effect between enzyme and surfactant was clearly seen in the experiment. Pulp samples with no enzyme treatment showed relatively high ERIC (Effective Residual Ink Concentration) value after flotation in comparing with enzyme-treated pulps. The results also revealed that the increase of enzyme and surfactant dosages led to the decrease of ERIC value while freeness of pulp, brightness, tensile and tear index of tested handsheets increased. However, the excessive of surfactant and enzyme dosages tended to reduce the efficiency of ink removal and paper strength. The optimum condition for this deinking process is the dosages of enzyme and surfactant of 0.1 wt% and 0.9 wt%, respectively. Such condition rendered pulp's properties as follow: 450.5 ± 1.29 ml freeness, 30.35 ± 0.90 ppm ERIC, 98.50 ± 0.71 %ISO brightness, 5.11 ± 0.23 mN.m²/g tear index, and 31.31 ± 0.36 Nm/g tensile index. On the environmental impact of enzyme deinking process, the result revealed that the effluent from this process has the chemical oxygen demand (COD) and pH value in the accepted range of industrial effluent standard.

Keywords: Cellulase; Flotation deinking; Nonionic surfactant;