

Environmentally Friendly KOH and NH₄OH-KOH Pulping of Rice Straw

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Abstract : The main problem that hinders the intensive use of non-wood raw materials in papermaking industry is the environmental pollution caused by black liquor. As a matter of fact, black liquor of nonwood pulping is discharged to the environment due to the lack of recovery. Traditionally, NaOH pulping produces Na-based black liquor that may increase soil erosion and reduce soil permeability. With substitution of KOH/NH₄OH with NaOH as the cooking liquor, K and N can act as a soil fertilizer while offering an environmentally acceptable disposal alternative. For this purpose, rice straw samples were pulped under the following conditions; Constant factors were: straw weight: 100 gram (based on oven dry), liquor to straw ratio 7:1 and maximum temperature, 170 and 180 °C. Variable factors for KOH cooks were: KOH dosage of 14, 17 and %20 on oven dry of straw and times at maximum temperature of 60 and 90 minutes. For KOH-NH₄OH cooks, KOH dosage of 5 and %10 and NH₄OH dosage of 25 and %35, both based as oven dry of straw were applied. Besides, time at maximum temperature was 90 minutes. Yield ranges of KOH and KOH-NH₄OH pulp samples were obtained from 37.28 to 48.62 and 45.63 to 48.08 percent, respectively. In addition, Kappa number ranged from 21.91 to 29.85 and 55.15 to 56.25, respectively. In comparison with soda, soda-AQ, cold soda, kraft, EDA (dissolving), De-Ethylene Glycol (dissolving), burst and tensile index for KOH pulp was more in similar cooking condition. With an exception of soda pulps, tear index of the mentioned pulp is more than all compared treatments. Therefore, it can be resulted that KOH pulping method is an appropriate choice for making paper of the rice straw. Also, compared to KOH-NH₄OH, KOH pulping method is more appropriate choice because of better pulping results.

Keywords : environmentally friendly process, rice straw, NH₄OH-KOH pulping, pulp properties

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