RAYON FILAMENT PROPERTIES FROM FIVE LESSER KNOWN TROPICAL WOODS SPECIES

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ABSTRACT

Five lesser known hardwood species from recently opened settlement area in Kalimantan and Sumatra islands of Indonesia were collected and identified as Symplocos sp., Pterygota sp., Schima sp., Nyssa sp., and Gymnotroches sp. The present experiments were intended to evaluate the potential of these species for dissolving pulp and rayon production. Prehydrolized kraft process was applied to pulp the woods and an ECF bleaching method with DEDED sequences were chosen to purify the resulting pulp. All dissolving pulp and rayon filament properties were compared to Indonesian Industrial Standard SNI 14-0938-1989 for regular rayon filament and high wet modulus (HWM) rayon filament properties. It has been found that these woods can be classified as class II for raw material of pulp making with medium to long fiber, medium wood density and acceptable bulk density of chips. Gymnotroches sp. was the most difficult to delignify, as indicated by the highest kappa number of 18.8. Except for pulp brightness, all parameters tested indicated that these species are highly potential for dissolving pulp and regular rayon production. Some parameters were even indicating that these woods can be used for HWM rayon fiber.

Keywords: *prehydrolysis, tropical hardwood, dissolving pulp, regular rayon, HWM rayon.*

INTRODUCTION

Cellulose derivatives such as viscose for rayon preparation require a highly purified pulp. Primary hydrolysis is the most commonly used for the first step to produce pulp with high content of α-cellulose. Its acidic condition will dissolve most of the hemicellulose (Kirci and Akgul, 2002), which is considered as contaminant in dissolving pulp. Purification is then continued through bleaching process. In the case of dissolving pulp production, α-cellulose content of pulp must be exceeding 90 %. Such requirement indeed requires total removal of lignin and other organic and inorganic substances.

Current environmental concern mandates an environmentally benign bleaching process such as those of elemental chlorine free (ECF) and totally chlorine free (TCF) methods. These bleaching methods are designed to improve the quality of bleaching effluent via reduction of absorbable organic halide (AOX) formation (Christov *et al.*, 1996).

Softwood such as pine (*Pinus merkusii*) is the most well known raw material of dissolving pulp. Several hardwoods, such as eucalypt (*Eucalyptus* sp.) and Gmelina (*Gmelina* sp.) have also been utilized (Ibnusantosa, 2002).

It has been understood that tremendous numbers of hardwood species in the tropic are highly potential for pulp and paper making. Ibnusantosa (2002) has predicted that over 400 tropical hardwood species in Indonesia might be utilized to produce dissolving pulp and rayon fiber. Further, thousand of lesser known species are believed to exist in Indonesian tropical forests. Those wood species have not been investigated.

Present research was conducted to evaluate the potential of five lesser known hardwood species for dissolving pulp and rayon filament production. Wood characteristics were also examined to find out their quality for the raw material of pulp making.

METODOLOGY

Characterization of Woods

Some lesser known wood samples were collected from new settlement area in Kalimantan and Sumatra islands of Indonesia. Identification of collected samples conducted in Forest Research and Development Agency – Bogor indicated that the woods were from species of *Symplocos* sp., *Pterygota* sp., *Schima* sp., *Nyassa* sp. and *Gymnotroches* sp. Following species identification, wood density, specific bulk density of wood chips, wood fiber characteristics, and lignin, cellulose and pentosan contents of wood were determined following the methods of Indonesian Industrial Standard SNI. 14. 0700-1998, SNI. 14. 0702-1998, SNI. 14. 4350-1996, SNI. 14. 0492-1990, SNI. 14. 1444-1989 and SNI. 14. 1304-1989, respectively.

Prehydrolysis Kraft Pulping

In the present experiments, prehydrolysis kraft process was used to produce the dissolving pulp. Preliminary hydrolysis of air dried wood chips was carried out in water at 165°C for 2 hours with liquor to wood ratio of 4 to 1. Following prehydroly-sis process, kraft pulping was then carried out at 170°C for 3.5 hours with liquor to wood ratio of 4 to 1. Sulfidity and active alkali used in the present experiments were 25 and 15%, respectively. After pulping process, cellulose retention (yield), kappa number, residual active alkali and pH were