

Abstract

Study on kraft pulping properties of *Acacia* spp. by near infrared reflectance spectroscopy

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Introduction

In order to estimate the raw materials of pulping and paper-making, *Acacia* spp. were selected in this study. The models of the pulp and paper properties of *Acacia* spp. were established by near infrared (NIR) spectroscopy and the kraft pulping properties could be evaluated by NIR spectroscopy for the pulp and paper-making industry.

Materials and Methods

Samples ($n = 73$) were prepared for kraft pulping with five species of *Acacia* woods from Nanning, Guangxi, China. The relationship between kappa number and the quality of paper was established by the NIR spectrometry (Bruker) of the pulp, paper and black liquor. The mathematical models of the properties of *Acacia* pulp and paper which were built by NIR could be used for predicting unknown samples.

Results and Discussion

The main results can be divided into 3 parts as follows. (1) The NIR spectrum was first obtained from *Acacia* spp. kraft pulp samples. Combined with partial least squares (PLS), the kappa number of the pulp and the analysis of pulping yield established by the NIR models showed that the correlation coefficients (R) of calibration model were 0.926 and 0.8923, the root mean square errors of cross-validation (RMSECV) were 0.978 and 0.568. (2) NIR has been used to predict paper property rapidly based on the weight, brightness, tensile index, tearing index and bursting index of paper samples. The data showed that the relationship between the paper property fitted by NIR and GB methods was highly linear. Also, the correlation coefficient of the calibration model was above 0.89 while, in the prediction model, it was above 0.82. In addition, RMSECV and RMSEP were very small. (3) NIR and PLS were used to calibrate the models of the *Acacia* spp. with wood particle size (40-60 mesh) including kappa number, pulping yield, tensile index, tearing index and bursting index. The results indicated that the R was above 0.8.

Conclusion

NIR spectroscopy could be regarded as an effective method for predicting the kappa number of the pulp, pulping yield and the properties of paper. The prediction with NIR was not accurate but it could be used for rough predictions.