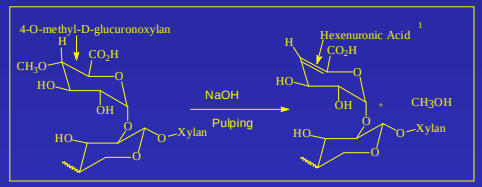
Evaluation of Hexenuronic Acids in US Kraft Pulps

Abstract

This study examines the role of hexenuronic acids in US HW and SW kraft pulps. The presence of hexenuronic acids was found to be a dominant component of the pulp kappa number for HW kraft pulps, whereas, for SW kraft pulps, it was found to be a minor component. Acid hydrolysis studies on HW kraft pulps suggest that it may be possible to reduce the apparent pulp kappa number by 35 –50% with a mild acid treatment prior to bleaching. The level of hexenuronic acids in a HW kraft pulp can be influenced by the extent of delignification.

Background



Clayton, *Svensk Papperstidning*, 28(4):1165(1963). Johansson, M.H., and Samuelson, O., *Carbohydr. Res.*, 54: 295(1977). Teleman, A., Siika-aho, M., Sorsa, H., Buchert, J., Perttula, M., Hausalo, T., and Tenkanen, M., *Carbohydr. Res.*, 293(1): 1(1996). Vuorinen, T., Fagerstrom, P., Buchert, J., Tenkanen, M., and Teleman, A., *J. Pulp Paper Science*, 25(5):155(1999).

Industry Benefits

- Hexenuronic acids consume D, Z, C and released upon treatment with acid.
- Hexenuronic acids resistant to O and P-stage.
- Impact oxalic acid formation of bleaching and retention of NPEs.

Typical HexA contribution to pulp kappa number of a:

- Northern HW Scandinavian kraft pulp is 30 – 35%.
- Northern SW Scandinavian kraft pulp is 10%.
- Radiate pine kraft pulp is 10%
- Japanese *Fagus crenata* Blume kraft pulp is 28%
- Japanese *Pinus densiflora kraft pulp* is 10%

Objectives

- Evaluate content of HexA in U.S.A. furnish
- Examine influence of pulping technologies on the formation of Hexenuronic acids.

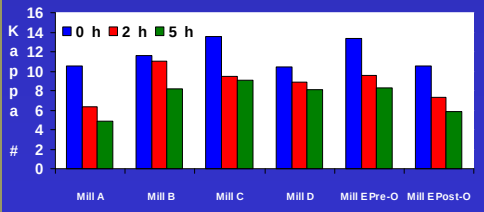
Methods

Hexenuronic acids in Pulp

- Utilize 25 gr (o.d.) pulp following procedure of Vuorinen, T. et *al*., 1996 International Pulp Bleaching Conference: Proceedings Washington, 43.
- Measured Δ kappa and 2-furoic acid by UV/Vis spectroscopy

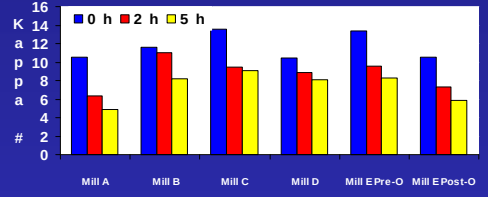
Results

Changes in kappa # after acid treatment of brownstock

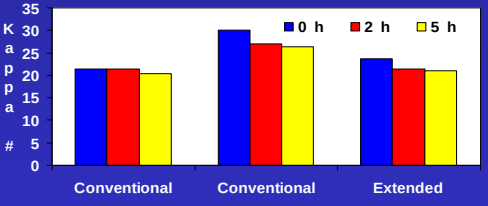


Mill HW Pulp After (0,2,5 h) Acid Hydrolysis

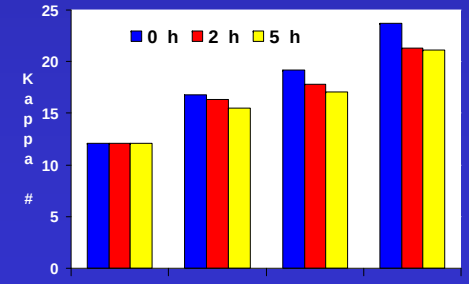
Results - continued



Mill HW Pulp After (0,2,5 h) Acid Hydrolysis

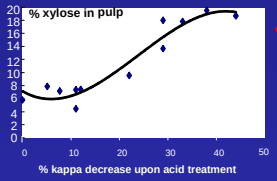


Mill SW Pulp After (0,2,5 h) Acid Hydrolysis



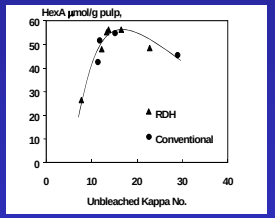
Lab SW Pulp After (0,2,5 h) Acid Hydrolysis

Results-continued

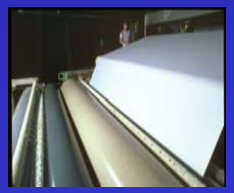


- Xylose content of kraft pulps correlates with hexenuronic acid content of kraft pulps

- Investigation into influence of batch cooking technologies on hexenuronic formation
  - RDH provides slightly diminished HexA formation
  - Extent of delignification most influential in controlling HexA contribution to batch/RDH pulps



Conclusions



- HexA contribute 22 - 55% of kappa # of commercial US HW kraft pulps and < 10% of commercial SW kraft pulps
- US HW pulp operations operate kraft pulping operations at a target kappa # that maximize HexA content in pulp.

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