545a Kinetics of the Dissolution of Hemicellulose from Softwood under Alkaline Conditions

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Hemicellulose is a group of heterogeneous polysaccharides consisting of hexosans, such as glucan, mannan and galactan as well as pentosans such as xylan and arabinan. The type of hemicellulose differs between different tree species. In this work, we have investigated pine softwood (Pinus sylvestris) having a hemicellulose content of about 24%, mostly galactoglucomannan (18%) and xylan (8%). Even if the content of hemicellulose is relatively high in wood and an extensive hemicellulose degradation takes place during pulping, surprisingly few reliable data on the reaction kinetics are available in the literature: most of the data are based on experiments made on wood chips of unspecified size (i.e. mass transfer at chip level is included in the kinetics) and at conditions where the concentration of the chemicals has not been even close to be constant and/or the temperature specification has been poor. In this investigation we have studied the kinetics of hemicellulose dissolution from wood powder (d<1mm) at very high liquor-to-wood ratio (200:1) and we have determined the temperature conditions during the experiment. In this paper we will present data covering the hemicellulose dissolution over a wide temperature span (93-168°C) and sodium hydroxide concentrations ranging from 10 g/kg to 50 g/kg, The sugar analyses of the wood residues have been made with a conventional method based on acid hydrolysis of the wood/pulp followed by analysis of the liberated sugars with ion-exchange chromatography. Based on these data we have calculated the hemicellulose content in the wood/pulp and developed expressions of the kinetics of the dissolution of hemicellulose from wood powder. One example of the experimental results can be seen in the figure below, which describes the dissolution of galactoglucomannan at different temperatures at a sodium hydroxide concentration of 10 g/kg solution.