STUDY OF THE ANIONS PROFILE THROUGHOUT THE SULPHITE PULP LINE

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ABSTRACT

The sulphite pulping, a current pulp production process, second only to kraft pulping, contributes to almost 10% of pulp market worldwide. Unlike to kraft process, sulphite pulping is carried out under acidic or neutral pH and is distinguished by a complex composition of pulping solutions. This fact is predetermined by the variety of oxy forms of sulphur under dynamic redox equilibria occurring in the pulping solution. The predominance of certain oxidized forms of sulphur plays a decisive role in the efficiency of wood delignification and in the course of auxiliary technological operations (liquor concentration by evaporation, liquor burning, and preparation of the cooking acid). The sulphite liquor is prepared by dissolution of SO₂ in water, forming sulphurous acid and free sulphur dioxide in equilibria that are further combined with the appropriate base (magnesium, sodium, calcium or ammonium), which increases the SO₂ retention in aqueous solution. Both oxidised (e.g. sulphates) and reduced (e.g. thiosulphate and polythionites) sulphur-derived species formed along the sulphite pulping are unuseful in delignification and can create several technological problems. This knowledge is crucial regarding the efficiency of the sulphite pulping. In this study the profile of anions in all stages of Mg-based pulping acid preparation and in spent liquor throughout the eucalypt sulphite fibre line process were assessed by Ion Chromatography (IC). The fluoride anions were analysed by Ion-Selective Electrode Method.

The concentrations of fluoride, chloride, bisulphite, sulphate, thiosulphate, phosphate and oxalate anions that are present in the pulping acids and in liquors from evaporation effects were quantified and the corresponding profiles thoroughly analysed. The results clearly show that the bisulphite concentration reach maximum in the reinforced filling acid being decreased one third during the cooking process. At the final cooking stage the concentration of the bisulphites decreased drastically. The sulphate anions were present already in the filling acid and their concentrations increased progressively along the pulping, reaching the maximum at the final stage of the cooking. Further increase in sulphates concentration was detected along the liquor evaporation stages reaching a maximum in the thick liquor. Contrary to common belief, the maximum concentration of thiosulphates was found in the filling acid and their concentration decreased along the cooking. The phosphates, chlorides and fluorides arises progressively during the cooking being extracted from the wood. Their concentration reaches a maximum in the thick liquor. Noteworthy that a significant amount of chlorides was present already in the filling pulping acid. A particular low-molecular fraction of lignosulphonates (LS) was detected in the pulping liquor after 2h at the final temperature, which concentration drastically increased at the final stage of the cooking and corresponded to the lignin release from wood. This LS fraction had the same retention time in IC analysis as both fluorides and xylonic acid and impeded their analysis in the streams. The ongoing work is running to identify this LS fraction that could promote the effective cooking control method. The efforts were also done to identify the amounts of polythionites in the pulping liquors.

Keywords: Anions Analysis, Dissolving Pulp, Ion Chromatography, Sulphite Process.