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Kinetics of laccase mediator system delignification of an *Eucalyptus globulus* kraft pulp

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Laccase mediator system (LMS) was applied to one industrial *Eucalyptus globulus* kraft pulp with kappa numbers 15.2, using violuric acid (VA) as mediator. The objective of the present work is to quantify the influence of the reaction conditions on the delignification rate and extent, establishing the kinetic equations. The effects of oxygen pressure, laccase and mediator charges, and reaction time on delignification were evaluated. The kinetic studies were carried out in a 1.5 L jacketed reactor with temperature control and magnetic mixer. The experiments were carried out with 10 grams of pulp at very low consistency (0.6%) in order to minimize inter-fibre mass transfer resistances. The oxygen pressure was varied between 1 and 7 bar and no significant differences were observed in terms of delignification rate and extent, at a given charge of laccase and mediator. The laccase (EC 1.10.3.2) charge was ranged between 10 and 250 IU per gram of pulp and the mediator between 10 and 70 mg per gram of pulp. The presence of mediator is required because the enzyme cannot diffuse into the porous structure of the fibre wall, where lignin should be oxidised. The delignification potential of the LMS was evaluated by measuring the kappa number of the pulp, after alkaline extraction. Control tests similar to the LMS followed by alkaline extraction, but without enzyme, were carried out and the mean value of kappa number was 14.04. The decrease of the kappa number of the pulp from 15.2 to 14.04 can be interpreted as the consequence of the extraction of some fragments of lignin during the two stages. This procedure enable us to access the real effect of laccase. The hexeneuronic acid (HexA) has, particularly in hardwood pulps, an important contribution to the kappa number value. However, the experimental data have shown that LMS does not remove significantly the HexA, which is in good agreement with the literature. So, the kappa number can be used to evaluate the potential of LMS to lignin extraction. For the levels of laccase 50 IU per gram and 40 mg of VA per gram, the delignification was reached 37%, which is a good result. The profile of kappa number with reaction time follows an exponential trend. In addition, the initial rate methodology is being used to quantify the influence of laccase and mediator concentrations on the kinetic rate. The data have shown that the delignification rate exhibits a linear dependence on the mediator concentration, for the low range tested. The effect of laccase charge seems to be lower. The experimental data are under exploitation.