

The chemical oxidation of lignin found in Sappi Saiccor dissolving pulp mill effluent

B Moodley^{1*}, DA Mulholland^{1,2} and HC Brookes¹

¹School of Chemistry, University of KwaZulu-Natal, Durban, 4041, South Africa

²Division of Chemical Sciences, Faculty of Health and Medical Sciences, University of Surrey, Guildford, GU2 7XH, United Kingdom

Abstract

Sappi Saiccor (situated in Durban, South Africa) dissolving pulp mill effluent, produced from an acid bisulphite pulping process, uses acacia and eucalyptus hardwoods to produce a unique and different blend of lignin that has not been previously studied. The chemical oxidation of lignin found in Sappi Saiccor's effluent has been investigated using a number of different chemical oxidising agents, such as nitrobenzene, oxygen with and without the presence of a copper sulphate pentahydrate catalyst, and hydrogen peroxide. The reaction products were extracted with acid and identified using GC-MS and LC-MS techniques. Nitrobenzene is a good oxidising agent but tends to produce many toxic by-products and would not be acceptable on an industrial scale. Oxygen oxidation has previously been shown to produce aldehyde-type compounds, and in this work has produced good yields of both vanillin and syringaldehyde compared to previous oxygen oxidation reactions. Hydrogen peroxide is a strong oxidising agent that tends to over-oxidise the lignin during long reaction times.

Keywords: chemical oxidation, lignin, effluent, vanillin, syringaldehyde