Abstract No: 356 (Poster) *Natural Sciences*

Selective capturing of phenol using lignin particles

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Lignin is the second most abundant natural polymer after cellulose, making up to 10-25% of lignocellulosic biomass. Lignin is a three-dimensional, highly cross-linked, aromatic polymer. It is composed of three types of substituted phenols; coniferyl, sinapyl and p-coumaryl alcohols that are linked by enzymatic polymerization, yielding a vast number of functional groups and linkages. There are many lignin sources available and depending on the extraction method physical and chemical behavior of lignin varies. Formic acid treatment followed by peroxyformic acid treatment was used to extract lignin from finely powdered saw dust. The lignin extracted was characterized by FTIR spectroscopy. Sonication and dialysis methods were used to synthesis lignin particles (1-10 μm). By exploiting the specific surface area and the hydrophobic character of lignin particles, it was applied as a biosorbent. Biosorption is one of the methods useful in the treatment of water contaminated with organic pollutants such as dyes and oils. Hydrophobic organic molecules are expected to interact with lignin particles mainly through hydrophobic interactions such as van der Waals forces and π-π stacking. In this study phenol absorption onto lignin particles was investigated in terms of adsorption efficiency and selective adsorption over cyclohexanol. The optimum dosage, pH, shaking time and settling time were investigated to determine the optimum conditions for phenol adsorption. The data were fitted in to Langmuir and Freundlich isotherms and the maximum adsorption capacity and the selectivity were determined.