INFLUENCE OF BIOMASS TO GLYCEROL RATIO ON THE LIQUEFACTION OF OAK (*QUERCUS ROBUR*) AND HEMP (*CANNABIS SATIVA*) FOR USE IN FORMALDEHYDE-FREE ADHESIVES

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ABSTRACT

The increasing demand for sustainable materials has accelerated efforts to replace formaldehyde-containing adhesives in wood composites with bio-based alternatives. In this study, the liquefaction of oak wood (*Quercus robur*) and hemp stalks (*Cannabis sativa*) using glycerol as a solvent and sulphuric acid as a catalyst under controlled conditions (150 °C, 120 min) is investigated. Three ratios of biomass to solvent (1:3, 1:4 and 1:5) were analysed. The oak biomass showed liquefaction percentage of liquefaction of up to 93.88%, with insoluble residues between 6.12 and 14.45% and a dry matter content between 50.13 and 54.78%. The hydroxyl number reached a maximum of 841.43 mg KOH/g, indicating a high density of reactive functional groups. Hemp biomass showed liquefaction percentage of liquefaction of up to 91.64%, insoluble residues of 8.36 to 15.27%, a dry matter content between 57.19 and 63.28% and a hydroxyl number of up to 829.61 mg KOH/g. Optimum results for both biomass types were achieved at a ratio of 1:5. These results emphasise the potential of liquefied oak and hemp as promising candidates for the development of formaldehyde-free adhesives that promote the use of environmentally friendly materials in the production of wood-based materials.

Keywords: oak, hemp, glycerol, liquefaction, hydroxyl number.