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## Brewers spent grain under deep eutectic solvent for biofilm production

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### Abstract:

Nowadays, several alternatives are under study to replace crude oil as the principal element in plastics, chemistry and energy. Lignocellulosic materials have been recognized as an alternative to multiple petroleum products. Hence, its transformation into building blocks for green chemistry and biopolymer production is crucial. Waste biomass lignocellulose material is abundant (500 million tons of dry matter per year in EU) and cheap (1 to 4 €/kg) and therefore of interest to valorize. This study aims to transform Brewer's Spent Grain (BSG), the lignocellulosic residue from brewing industries into a biofilm. The effect of deep eutectic solvent (DES) coupled with ultrasound assisted treatment, followed by sodium hydroxide reaction under mild conditions were evaluated.

In order to understand the reaction between solvents and biomass, TGA, FTIR, NMR, and microscopy analysis were carried out on the solid fraction and soluble fraction. The benefit of using ultrasound assisted treatment with deep eutectic solvent reaction was confirmed by FTIR spectra, with an increase in the intensity of hydroxyl stretching vibration band which could be correlated to higher polymers and protein dissolution. Additional results showed the advantage of sodium hydroxide to dissolve residual lignin, hemicelluloses and protein. The high pH upgraded the protein interaction with polymer, since the alkaline media was far from the isoelectric point of protein. Finally, the casting and drying process of both the solid and soluble fractions resulted in a film easy to peel off at 50°C.