

RIGID POLYURETHANE FOAMS FROM OXYPROPYLATED WHEAT STRAW LIGNIN

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Rigid polyurethane (PU) foams are used as thermal insulation, for example in refrigerators and construction materials. Polyols for rigid PU foams production are derived mostly from petrochemical products but it can be replaced by polyols obtained from natural raw materials (vegetable oils, tall oil, lignin etc.). Lignin is the most abundant aromatic polymer in the nature and it is isolated from chemical pulping or biorefining as byproduct. The most common lignin utilization is steam and power production through combustion but research in value added products is continuing [1].

Organosolve lignin from CIMV biorefinery (France) was used in our work. Different lignin and propylene oxide (PO) ratio (0.15-0.40) was used to get lignopolyols. Obtained lignopolyols were brown, long-term stable liquid with viscosity higher than 1720 Pa·s. Commercial polyol Lupranol 3300 was substituted by each lignopolyol in the compositions of rigid PU foams to investigate lignopolyol effect to density, closed cell content, physical-mechanical properties and water absorption.

Lignopolyol did not affect the closed cell content of samples – it is more than 90% for all foams. Water absorption is better for samples obtained from lignopolyols than neat foams. Compressive strength increases for foams where lignin and PO ratio is from 0.2 to 0.4 (Fig.1). For materials with ratio up to 0.15 compression strength is decreased because lignopolyol hydroxyl value is lower (OH=280 mg KOH/g) than Lupranol 3300 (OH=400 mg KOH/g) used for neat foams. For lignopolyols with lignin and PO ratio >0.20 hydroxyl value is approximately the same or higher (OH=400-470 mg KOH/g).

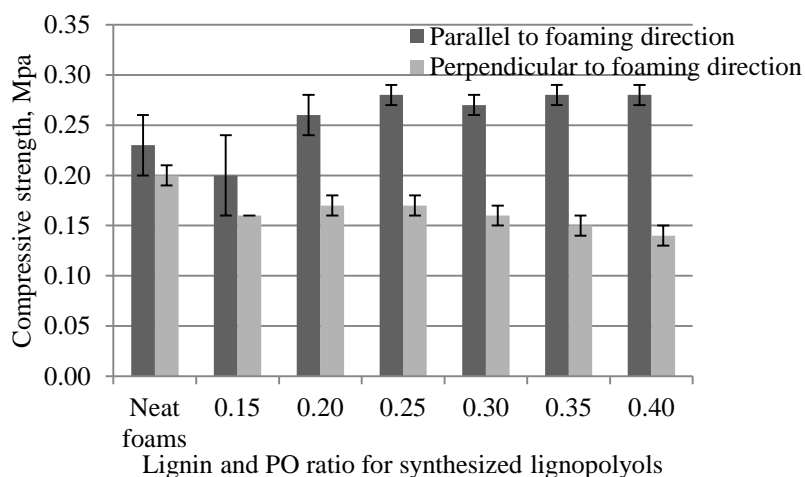


Fig. 1. Compressive strength of rigid PU foams obtained from Lupranol 3300 (reference sample L3300) and from lignopolyols with different lignin and propylene oxide ratio.

Lignopolyols synthesized from CIMV lignin by oxypropylation reaction is prospective material to obtain rigid PU foam with improved characteristics such as water absorption and compression strength.

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References

1. X. Pan, J.N. Saddler. *Biotechnology for Biofuels*, **6**:12 (2013).