WOODWORKING WASTEWATER BIOMASS EFFECTIVE SEPARATION AND ITS RECOVERY

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Introduction

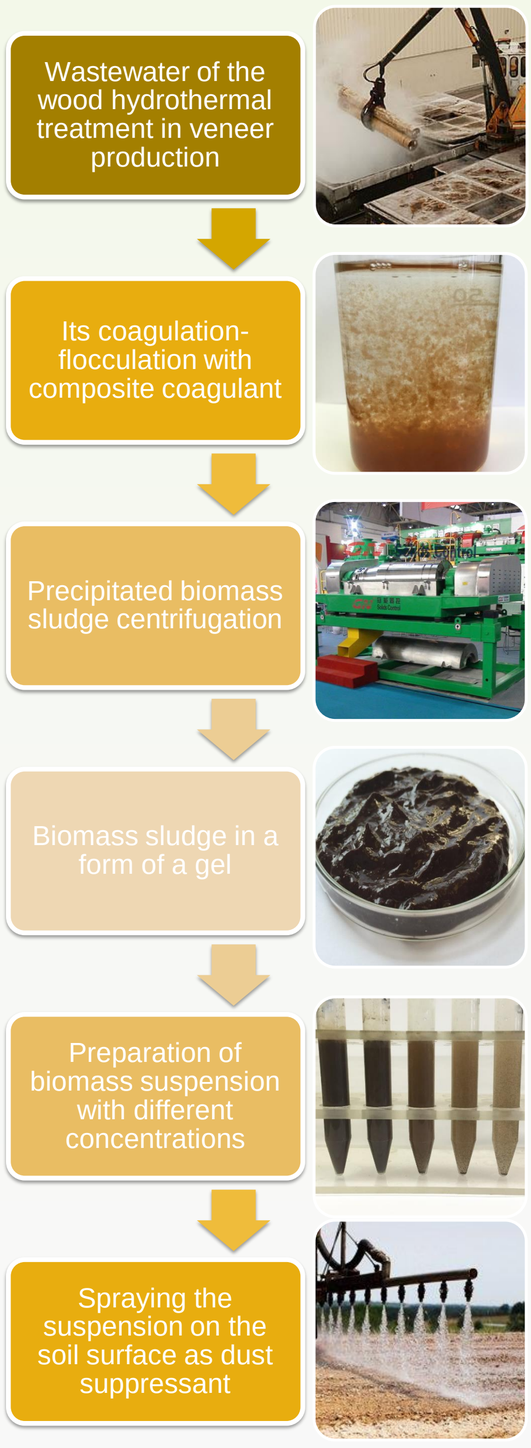
The production of veneer in Latvia and many countries of Eastern Europe is accomplished by the hydrothermal treatment of hardwood in special water basins for 16-18 h at a temperature of approximately 50ºC and a normal pressure. The obtained wastewater is rich in lignocellulosic biomass, consisting of hemicelluloses, lignin, lignin-hemicelluloses complexes and wood extractive substances. Keeping in mind the volume of the polluted effluents formed annually and the zero waste policy for rational use of bioresources, it is very important for efficient extraction of the formed biomass from the effluents to achieve more rational utilization than the dilution with pure water to maximum allowable concentrations and discharging to natural water basins.

Coagulation–flocculation is one of the most common processes in wastewater treatment, which can efficiently remove turbidity and natural organic matter. Recently, research interest has been directed towards improving the coagulation and flocculation efficiency of pre-polymerized metal coagulants by incorporating polyelectrolytes into their formulation. These new coagulants combine the positive aspects of their individual components, leading to improved coagulant stability, a wider effective pH range than conventional coagulants, improved coagulation efficiency, and denser flocks with good settling properties.

The proper management of precipitated biomass sludge is also an issue of these wastewater treatment plants. Incineration, composting and landfill are the most common sludge disposal methods used over the years. It is known that wood originated by-products can be used for soil improvement as well as a dust suppressant for gluing sandy surface.

The aim of this work was to increase the efficiency of the recovery of birch biomass from plywood production wastewater using the new developed composite coagulant (CCPEI) and to study the possibility of using the extracted biomass as an agent for dust suppression.

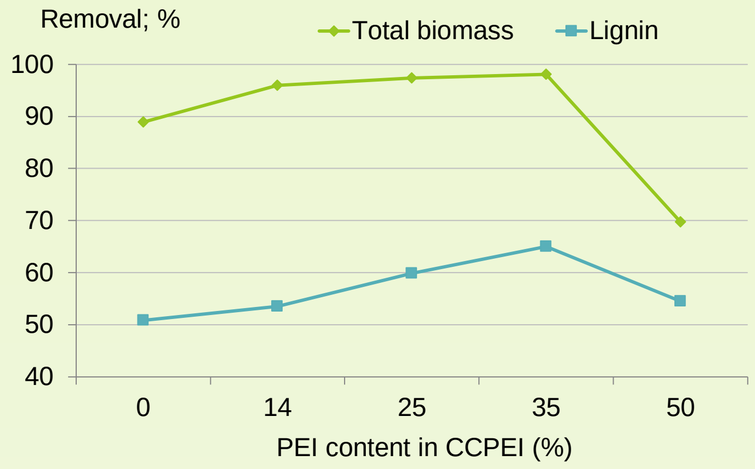
Materials and Methods

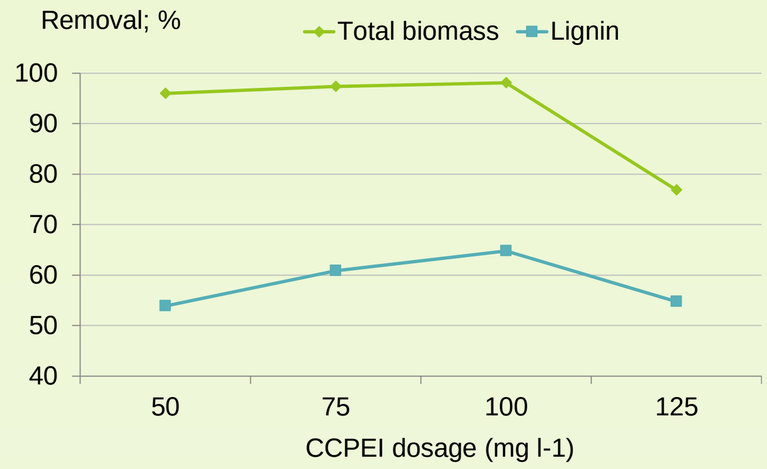


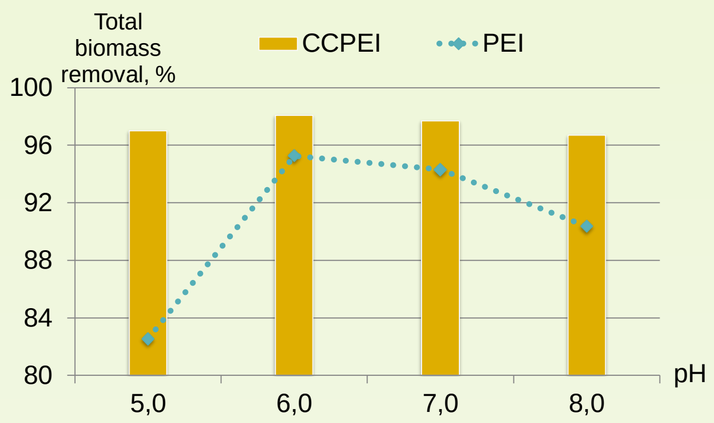
technological scheme of separation of the biomass from the wastewater and its application

Results

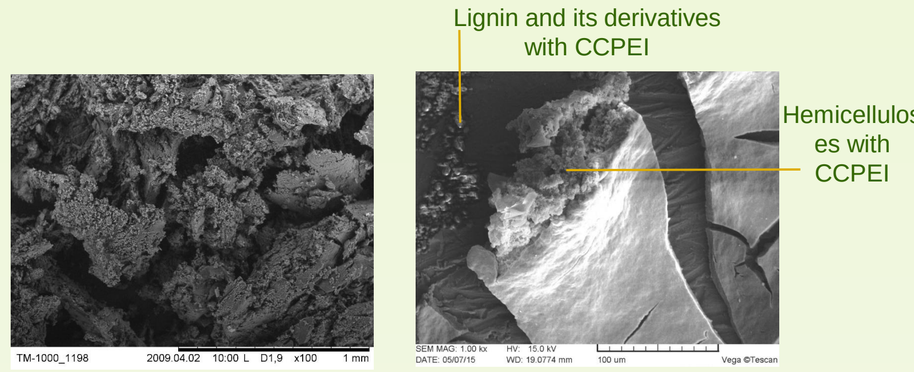
ISOLATION OF BIOMASS WITH COMPOSITE COAGULANT BASED ON POLYETHYLENEIMINE (CCPEI)





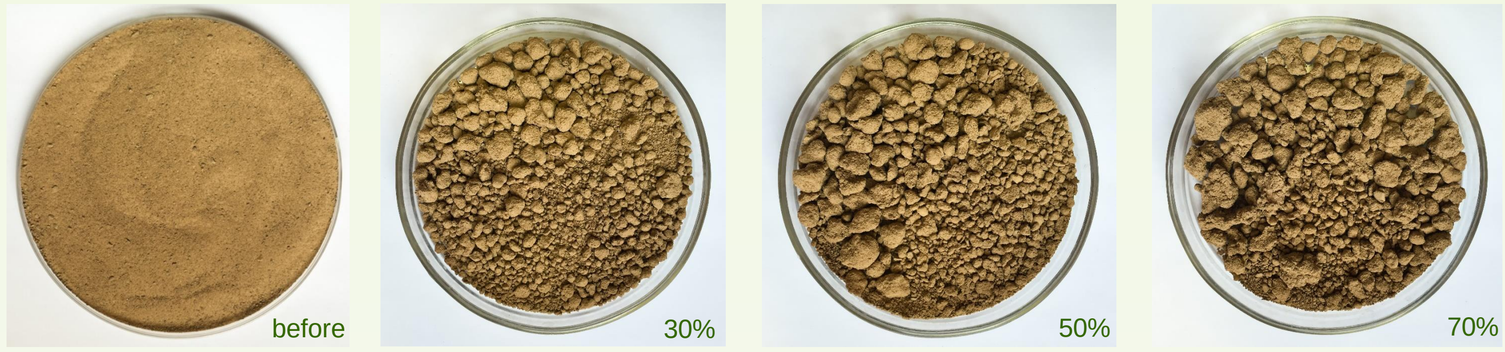


Comparison of biomass coagulation efficiency with CCPEI (35% PEI) and PEI

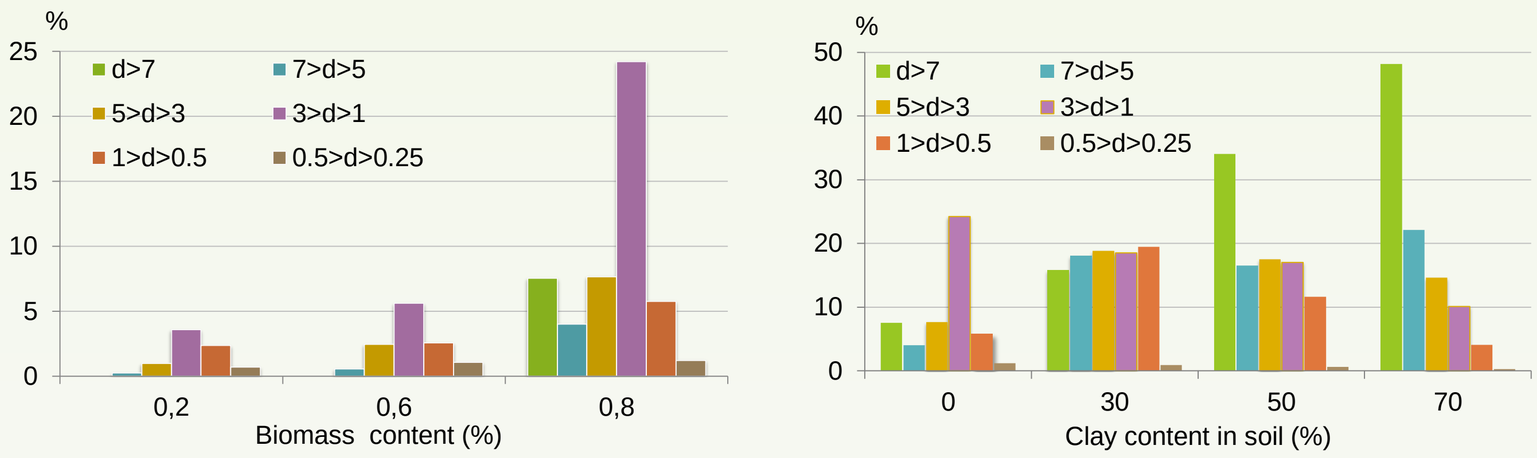


SEM image of the dried biomass and precipitated biomass with CCPEI

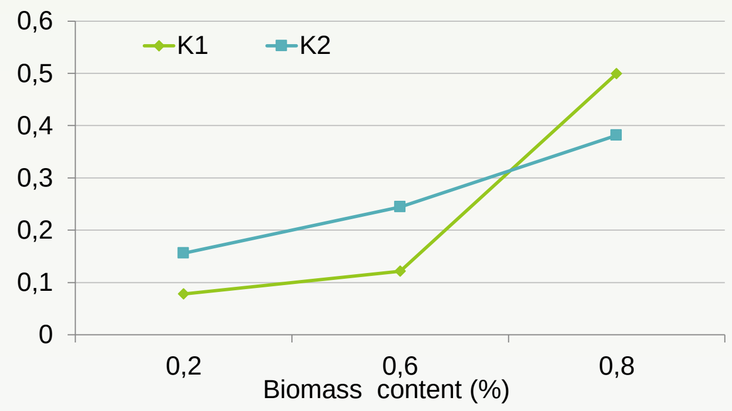
PRECIPITATED BIOMASS AS STRUCTURING AGENT

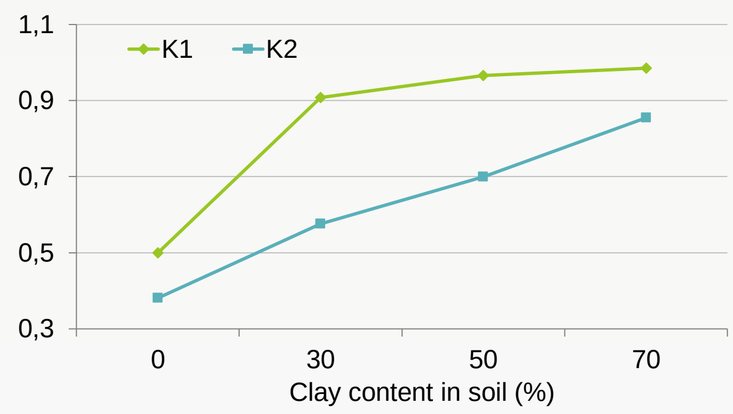


Sand before and after structuring with biomass (biomass content 0.8%; clay content in soil – 30,50,70%)



Fractional composition of sand structured with biomass





Structuring coefficients K1 and K2 depending on the biomass content

Conclusion

1. In the study, the new composite coagulant CCPEI was developed. Using the developed CCPEI at the optimal coagulation parameters the separation of the wood biomass achieves 97%, but the extraction of lignin and lignin-like substances is more than 65%.

2. The separated wood biomass is able to glue the dusty sand with the formation of sandy aggregates. The obtained results show its potential application as a structuring agent for dust suppression.

References

1. Vitolina, S., Shulga, G., Neiberte, B., Livcha, S., Verovkins, A., Puke, M., Reihmane, S. (2014) The efficiency of biomass removal from model woodworking wastewater with polyethylenimine. In CD Proc. 9th International Conference on Environmental Engineering, Vilnius, Lithuania, May 22–23.

Acknowledgments

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