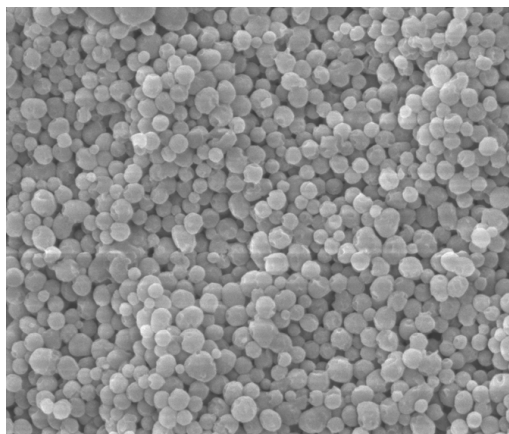


### Production of sulphur free lignin nanoparticles

Lignin is a natural aromatically polymer which is part of plant cell wall. Depending on the plant resource, the content of lignin in the plant varies from 16-24% for hardwood, 25-31% for softwood, 15-27% for wheat straw and 41-45% for coconut fibre. Additional valuable products can be produced to lignin from the cellulose and the hemicellulose fraction of the plant.

#### BACKGROUND

To extract lignin from plants a size reduction to about 5 to 10 mm is necessary prior to a following extraction step. For the lignin extraction a mixture of an organic solvent and water is used. As organic solvents alcohols and ketones or mixture thereof can be applied. The extraction step is performed in a pressure vessel in the temperature range of about 175 to 190 °C with a corresponding pressure up to 60 bar for the required extraction time depending on the substrate used. Depending on the combination of extraction liquor composition and pH, extraction temperature and time, the amount of lignin extracted from the plant will be influenced. The precipitation of the lignin nanoparticles can be produced in the precipitation step directly from extraction solution just after the filtration to remove substrate particles.



The received lignin nanoparticles are in the range of several 100 nanometers and can be influenced by the extraction and the precipitation parameters. The produced nanoparticles can be derived in uniform particle size distribution as can be seen in the picture.

**REFERENCE:**  
M033/2016

**APPLICATIONS:**  
Natural polymer  
Cosmetics (UV block)  
Drug delivery material  
Antioxidant material  
Enzyme carrier  
Functionalized Carrier  
Adsorbent material

**DEVELOPMENT STATUS:**  
Laboratory scale  
Pilot scale in preparation

**KEYWORDS:**  
Bioeconomy  
Biorefinery  
Organosolv process  
Lignin extraction  
Nano Lignin production in direct line

**IPR:**  
AT, PCT patent applications filed

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#### FURTHER READING

Win N, Weinwurm W, Friedl A. Biomass Conv. Bioref. (2016) 6:355-364  
Weinwurm et al. Journal of Cleaner Production (2015) 135: 62-71  
Weinwurm F et al. Chemical Engineering Transactions (2014) 39:583-588

#### BENEFITS

- sustainable material for polymer, natural resins, natural foams
- UV blocker in cosmetics or as protection for materials
- Food additive with antioxidative properties
- Carrier material for enzymes, chemicals and pharmaceuticals
- Adsorption and filter material

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