



### Inovativna raba lesa, les kot vir zelenih kemikalij

Les pogosto opisujemo kot sekundarni ksilem, ki ga kambij v procesu sekundarne rasti debela ali veje proizvaja navznoter, v smeri stržena. Les lahko definiramo tudi kot trdo vlakneno snov, ki se nahaja pod skorjo debel in vej dreves in grmov. S kemijskega vidika pa les vidimo na nekoliko drugačen način, torej kot biokemijski proizvod dreves, hierarhično urejen naravni kompozit, ki je sestavljen iz treh osnovnih strukturnih gradnikov, iz celuloze, lignina in hemiceluloz, ter iz nestrukturnih komponent, spojin, z nižjo molekulsko maso.

Tako strukturne kot nestrukturne komponente lesa in skorje danes izkazujejo velik aplikativni potencial v različnih bioosnovanih produktih in so zato deležne velike znanstvenoraziskovalne pozornosti. Strukturne komponente lesa, predvsem nanoceluloza (CNF in CNC), lignonanoceluloza (LCNF) in lignin z ligninskimi nanodelci (LNPs), zaradi ugodnih fizikalnih in mehanskih lastnosti izkazujejo velik potencial na področju naprednih bioosnovanih materialov. Nestrukturne komponente lesa (NSCs), ki jih splošno poimenujemo ekstraktivi, se zaradi antioksidativnih in antimikrobnih lastnosti že uporabljajo kot naravni antioksidanti v prehranskih dopolnilih. Les in skorjo dreves torej obravnavamo kot obnovljiv vir zelenih kemikalij in dragocenih spojin, ki s svojimi lastnostmi ponujajo alternativo sintetičnim in okolju škodljivim kemikalijam in materialom.

Danes veliko beremo o trajnostni rabi in krožnem gospodarstvu. Sklop političnih pobud Evropske komisije, t.i. evropski zeleni dogovor, katerega glavni cilj je, da Evropska unija do leta 2050 postane podnebno nevtralna, vključuje tudi koncepte zele-

nega prehoda in krožnega gospodarstva, ki dajejo prednost recikliranju in trajnostni uporabi surovin, zlasti tistih naravnega izvora. V tem kontekstu kot strateško pomembno surovino obravnavamo tudi manj vredno drevesno biomaso, različne ostanke, ki se jih še vedno najpogosteje uporablja kot surovino v proizvodnji lesnih plošč ali kot vir energije. V Sloveniji že obstajajo lesni obrati z razvitimi stranskimi proizvodnimi tokovi, to so stranske vrednostne verige, ki dejansko producirajo izredno visoko dodano vrednost glede na vhodno surovino. V tej zgodbi je potrebno omeniti tudi pomembno vlogo Strateško razvojnih-inovacijskih partnerstev (SRIP, Mreže za prehod v krožno gospodarstvo), to so mreže partnerstev, ki omogočajo učinkovit prehod v krožno gospodarstvo. SRIP uspešno povezuje gospodarske subjekte, izobraževalno-raziskovalne in razvojne institucije ter različne nevladne organizacije v nove verige vrednosti po načelih ekonomije zaključenih snovnih tokov. Ta strateška partnerstva omogočajo učinkovit prenos znanja v prakso, s tem pa skušajo trajnostno povečati učinkovitost in konkurenčnost domačega gospodarstva. SRIP vsako leto organizira tudi študentske natečaje na področju bio-osnovanih inovacij (BISC-E), s čimer skuša študentom pomagati pri preboju na trg s krepitvijo njihovih kompetenc.

V pričujoči številki revije Les/Wood so predstavljeni izsledki analize verig vrednosti na področju konstrukcij in lesene gradnje v Franciji in inovativni pristop za obdelavo površine lesa z mešanico komercialno dostopnih olj in utekočinjenega lesa. Bralke in bralci boste dobili vpogled v mehanske in

kemijske lastnosti lesa nekaterih manj znanih drevesnih vrst s plantaž v Gani. Predstavljen je tudi potencial ostankov mlete kave za proizvodnjo peletov

in vpliv nanosa voska na barvo ter sijaj in indeks beline lesa ameriške čremse (*Prunus serotina*). Želimo vam prijetno branje.

## Innovative uses of wood, and wood as a source of green chemicals

Wood is often referred to as secondary xylem, which is formed by the cambium in the process of centripetal secondary stem growth. It can also be defined as a hard-fibrous substance under the bark of stems and branches of trees and shrubs. From a chemical point of view, we see wood somewhat differently, i.e. as a biochemical product of trees, a hierarchically ordered natural composite consisting of three basic structural components, cellulose, lignin and hemicelluloses, and non-structural components, i.e. compounds of lower molecular weight.

Both the structural and non-structural components of wood and bark have great application potential for various bio-based products and are therefore receiving considerable attention in research. The structural components of wood, especially nanocellulose (CNF and CNC), lignonnanocellulose (LCNF) and lignin with lignin nanoparticles (LNPs), show great potential in the field of advanced bio-based materials due to their favourable physical and mechanical properties. The non-structural components of wood (NSCs), commonly referred to as extractives, are known for their antioxidant, antimicrobial and antimicrobial properties and are already used, for example, as natural antioxidants in dietary supplements. Wood and tree bark are therefore considered a renewable source of green chemicals and valuable compounds that provide an alternative to synthetic and environmentally harmful chemicals and materials.

Today, we read a lot about sustainability and the circular economy. A set of European Commission policy initiatives, such as the European Green Deal, whose main objective is to make the European Union climate neutral by 2050, also include the concepts of the green transition and circular economy, which prioritize the recycling and sustainable use of raw materials, especially those of natural origin. In this context, we also consider the less valuable tree biomass, various residues that are still most com-

monly used as a raw material for the production of wood panels or as a source of energy, as a strategically important raw material. In Slovenia, there are already timber plants with developed side streams, i.e. secondary value chains that generate high added value in relation to the raw material used. In this story, the extremely important role of the strategic research and innovation partnership (SRIP, Networks for the transition into circular economy), i.e. networks of partnerships that enable an efficient transition to a circular economy, must also be mentioned. The SRIP successfully connects companies, educational, research and development institutions and various non-governmental organizations in new value chains based on the principles of the circular economy. These strategic partnerships enable an efficient transfer of knowledge to industry in order to sustainably increase the efficiency and competitiveness of the domestic economy. Every year, the SRIP also organizes student competitions in the field of bio-based innovations (BISC-E), which aim to facilitate students' entry into the professional world by strengthening their competences.

This issue of the Les/Wood journal presents the results of the analysis of value chains in timber construction in France and the innovative approach of the staining of oil coatings with liquefied wood. Readers are also given insights into the mechanical and chemical properties of wood from selected tree species from plantations in Ghana, the potential of ground coffee residues for the production of pellets and finally the effects of applying wax on the colour, glossiness, and whiteness index values of American black cherry (*Prunus serotina*) wood. We wish you an enjoyable read.