

What do we mean when we say “lignin”? The answer depends on who you ask. A wood chemist probably regards lignin as a macromolecule with a certain chemical structure. For the pulp producer, “lignin” might be the same as the kappa number, whereas from the biorefinery perspective, we often use the term “lignin” for a preparation or a product that consists mainly of lignin (from a chemical perspective) containing more or less contaminants. What goes into the concept of “lignin” thus depends on the context and the perspective.

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# We need a common language to describe lignin

The greatest challenge to lignin trade and development is to prepare technical specifications for different lignin applications. In order to do that, we need a common language to describe lignin properties. As mentioned above, we lack a common definition of “lignin”. Furthermore, we also lack analytical methods that give the same results, regardless of who performs them.

At Innventia, we have identified three groups of properties that we need to analyse in order to describe a lignin preparation: purity, molecular properties and thermal properties.

Purity includes content of lignin, moisture and various impurities (for example carbohydrates, extractives and inorganics). The main problem is that almost all standardized methods were developed for wood, pulp and paper, and may not be directly applicable to lignin samples. Lignin samples usually contain higher amounts of volatile substances compared to wood and pulp samples. These substances evaporate during drying, which makes it difficult to determine the actual dry content of the sample. You might even ask what the “sample” is. Is it the lignin including the volatiles, or is it the dried preparation?

Once again, a clear definition of the term “lignin” would be very useful.

Molecular and thermal properties include molecular mass, functional groups, melting properties, etc. Many different, more or less established methods are available but no standard methods exist. In many cases these methods involve several analytical parameters that may be varied, for example type of analytical instrument or instrument parameters. The results obtained may be completely different depending on the method or method parameters of choice. Therefore it is very difficult to compare results obtained by different labs or on different occasions. To overcome these difficulties, several groups have made attempts to harmonize methods, but to our knowledge there are still no generally accepted methods. With some self-criticism, one might hazard a guess that most researchers are fond of their own particular methods and prefer to continue using them.

In conclusion, to be able to trade lignin and develop lignin-based products, we need specifications. Analytical data from the trader must be possible to reproduce in the purchaser’s lab. In order to get there, we need to raise the

question of analytical methods for lignin to a higher level. The players within the field need to agree on definitions and harmonize methods. That way, we can start creating the necessary common language. This is something that we at Innventia will increasingly work on during the coming years, together with our partners. ●

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 **Den största utmaningen** för att kunna sälja lignin och utveckla nya värdefulla produkter är att ta fram kravspecifikationer för lignin med olika användningsområden. För det krävs ett gemensamt språk för att beskriva ligninets egenskaper. Det har vi inte idag. Det saknas en definition av termen ”lignin”, men också analysmetoder som ger samma svar oberoende av vem som utför analyserna. På Innventia har vi identifierat tre grupper av egenskaper som vi behöver kunna analysera för att beskriva ett ligninpreparat: renhet, molekylära egenskaper och termiska egenskaper. Problemet är att nästan alla standardmetoder är framtagna för ved, massa och papper, och det är inte självklart att de fungerar på ligninprover.