The use of technical lignins in the development of surface sizing formulations for packaging papers

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Approach and Methods

Pulp mill

Kraft lignin
- Precipitation
- Modification

Lignosulfonate
- Ultrafiltration

Application in surface sizing
Partial or total substitution of conventional surface sizing agents
Approach and Methods

Facts about Technical Lignins

Ultrafiltrated Lignosulfonates (LS)
- Water soluble at neutral pH
- Average Mw of ultrafiltrated LS ~ 9 kDa
- Surface sizing in neutral, acidic or alkaline conditions
- Further modification in aqueous system by e.g. enzymes possible

Precipitated Kraft lignin (KL)
- Water insoluble at neutral or acidic pH
- Average Mw of precipitated KL ~ 4 kDa
- Further modification by e.g. enzymes is not possible

Challenge ➞ Water solubility at neutral or slightly alkaline conditions!
Approach and Methods
Transformation of Kraft Lignin

Kraft Lignin
H-Form

Precipitated Kraft Lignin
• pH ~ 2 pH
• ZP – 0 mV

Stirring and pH adjustment using NaOH / H$_2$SO$_4$

Water soluble Kraft Lignin
• pH ~ 11.5
• ZP ≥ ±30 mV

Zeta potential measured with Stabino Charge Mapping

[2] Suspension with ZP ≥ ±30 mV should be stable, www.malvern.co.uk

Kraft Lignin
Na-Form

Stirring and pH adjustment using NaOH / H$_2$SO$_4$

Water soluble Kraft Lignin
• pH ~ 8
• ZP ≥ ±30 mV

Modification possible!!
Approach and Methods
Precipitation and Ultrafiltration

Precipitation plant

Ultrafiltration

Precipitated Kraft Lignin

Lignosulfonate from ultrafiltration

Laboratory drawdown coater
Industrial partners:

Scientific Partners:
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