EFFECT OF UV-TREATMENT ON PROPERTIES OF COATED PAPER WITH BIOPOLYMERS

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Why biopolymers?
Coatings with biopolymers
Research focus
Results
Summary
- Biopolymers have been widely studied in recent years

- Commonly used biopolymers: starch, pectin, chitin, chitosan, xylan, lignin

- Environmental concerns - low environmental footprint

- Recyclability of packaging materials

- Great barrier coatings on paper, board etc.
CHITOSAN AND RICE STARCH COATING

Improved:

- PHYSICAL PROPERTIES
  - Tensile properties
  - Roughness
  - Mass per area
  - Moisture

- BARRIER PROPERTIES: gas, grease, moisture, ...

- OPTICAL PROPERTIES
  - Colour
  - Gloss
  - Opacity

COATINGS WITH BIOPOLYMERS

- Physical Properties
- Barrier Properties
- Optical Properties
WHY UV radiation/treatment?
- Increases bonding
- quicker drying
- Improves scratches, surface
RESEARCH FOCUS

- Chitosan and rice starch coating (two different ratios → 2:1 and 1:1)
- UV treatment (drying paper)
- Improved mechanical, optical, barrier properties
- Improved surface properties with the most suitable ratio of the coating
FUNCTIONALISATION OF PAPER SURFACE WITH CHITOSAN+RICE STARCH COATING USING UV

- Potential target applications:
  - Packaging materials for fruits, vegetables, baker’s wares
  - Barrier properties which are very important for biobased food packaging materials
RESULTS

THICKNESS

<table>
<thead>
<tr>
<th>Thickness (m)</th>
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<tbody>
<tr>
<td>0.121</td>
</tr>
<tr>
<td>0.129</td>
</tr>
<tr>
<td>0.130</td>
</tr>
<tr>
<td>0.132</td>
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<tr>
<td>0.136</td>
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- Uncoated
- Coated/dryer 1:1
- Coated/dryer 2:1
- Coated/UV 1:1
- Coated/UV 2:1
RESULTS
RESULTS
RESULTS
RESULTS
RESULTS

<table>
<thead>
<tr>
<th>Text Type</th>
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<tbody>
<tr>
<td>Coated/dryer 1:1</td>
<td>0.53</td>
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<tr>
<td>Coated/dryer 2:1</td>
<td>0.64</td>
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<tr>
<td>Coated/UV 1:1</td>
<td>0.79</td>
</tr>
<tr>
<td>Coated/UV 2:1</td>
<td>0.81</td>
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RESULTS
RESULTS

Uncoated paper

Coated paper and dried in a standard drier (1:1)

Coated paper and dried in a standard drier (2:1)
Uncoated paper

Coated paper and dried in UV drier (1:1)

Coated paper and dried in UV drier (2:1)
• The tensile strength and elongation at break increased on coated paper compared to uncoated.

• Optical properties of coated paper increased due to smoother surface of the paper.

• Coated paper dried in a conventional drier has lower tensile strength, elongation and break and water vapour permeability due to coated paper treated with UV drier.

• Observations using scanning electron microscope have proven that mixture of chitosan and rice starch penetrated into the paper and still exhibited good water absorptivness and tensile properties.
The results showed the changes of UV treated paper in the FTIR spectra as expected.

Paper coated with ratio 2:1 of chitosan and rice starch showed increased yellowing compared to coating with ratio 1:1.

The research has proven increased physical and optical properties on coated, UV treated paper.

To be continued....
THANK YOU FOR YOUR ATTENTION!