

Structure and Properties of PP/Wheat Straw

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### Introduction

**Opportunities:**

- Wheat straw - 30 million tonnes in Canada (2004)
- Renewable
- Environmentally friendly
- Low specific gravity
- High specific properties
- Low cost: \$0.08 – \$0.15/lb

**Drawbacks:**

- Low processing temperatures
- Moisture uptake

**Applications:**

- automotive (door panels, passenger rear decks)
- construction (fencing, decking)

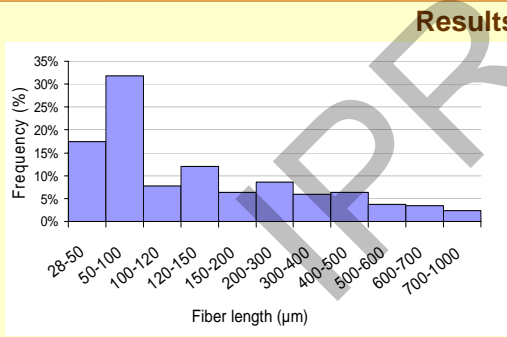
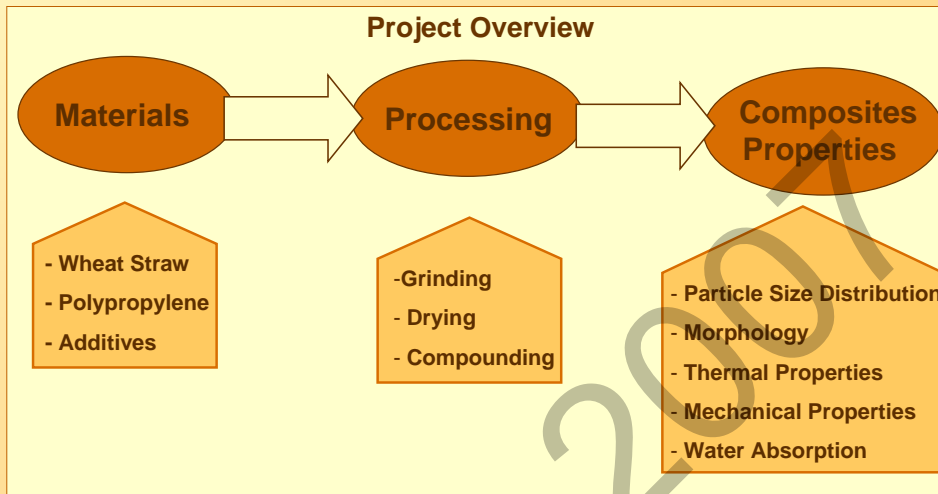


Figure 1: Fiber length distribution after grinding.

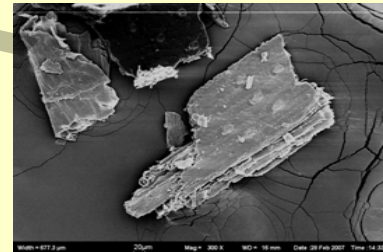


Figure 2: SEM micrograph of wheat straw after processing at 190°C.

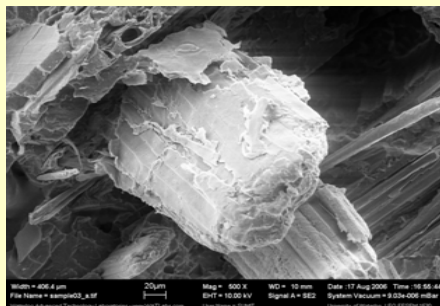


Figure 3: Wheat straw-PP composite processed at 190°C.

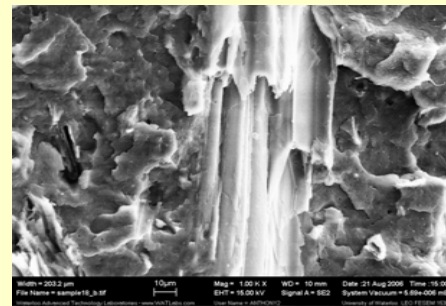


Figure 4: Wheat straw - PP composite containing MAPP.

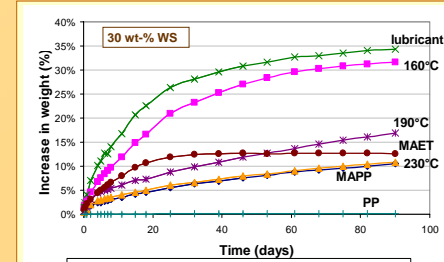


Figure 5: Water absorption behaviour of wheat straw-PP composites.



Figure 6: WS-PP composite containing lubricant.  
 Figure 7: WS-PP composite processed at 230°C.

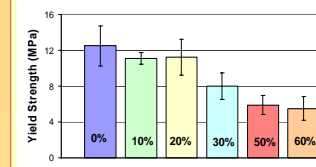


Figure 8: Yield strength of wheat straw-PP composites processed at 190°C.

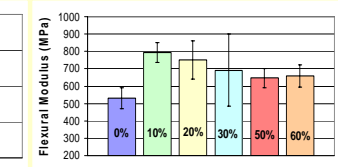


Figure 9: Flexural modulus of wheat straw-PP composites processed at 190°C.

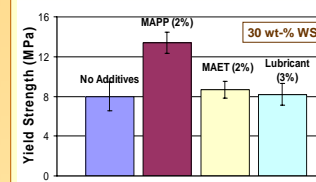


Figure 10: Yield strength of wheat straw-PP composites processed at 190°C, containing different additives.

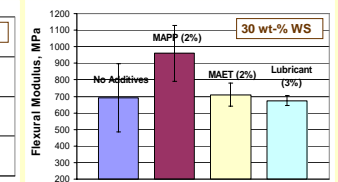


Figure 11: Flexural modulus of wheat straw-PP composites processed at 190°C, containing different additives.

Conclusions

- Fibres are short and have cylinder/flake shape. Average aspect ratio 2:1
- Higher processing temperature increases fibre damage
- Coupling agents improve matrix – filler adhesion
- Sample containing lubricant (Glycolube) presents the highest water absorption
- Yield strength of PP decreases and flexural modulus of PP increases with addition of wheat straw fibres
- Highest flexural modulus and yield strength – MAPP

Acknowledgements

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### Objectives

- Preliminary characterization of wheat straw – polypropylene composites
- Access and evaluate the final properties of the composites in relation to:
  - the wt-% of filler
  - processing conditions
  - presence of additives