

VALORIZING DARBHA GRASS FIBRE TO DEVELOP ECO FRIENDLY BIO-NANOCOMPOSITE BASED ON PP / EPDM FOR IMPACT RESISTANT APPLICATION

Akhil.K(MUT18ME008), Bharath.P.B (MUT18ME022), Jonathan Reggie Ebenezer(MUT18ME038), Sai Nived.M.V. (MUT18ME055)

Department of Mechanical Engineering, Muthoot Institute of Technology and Science

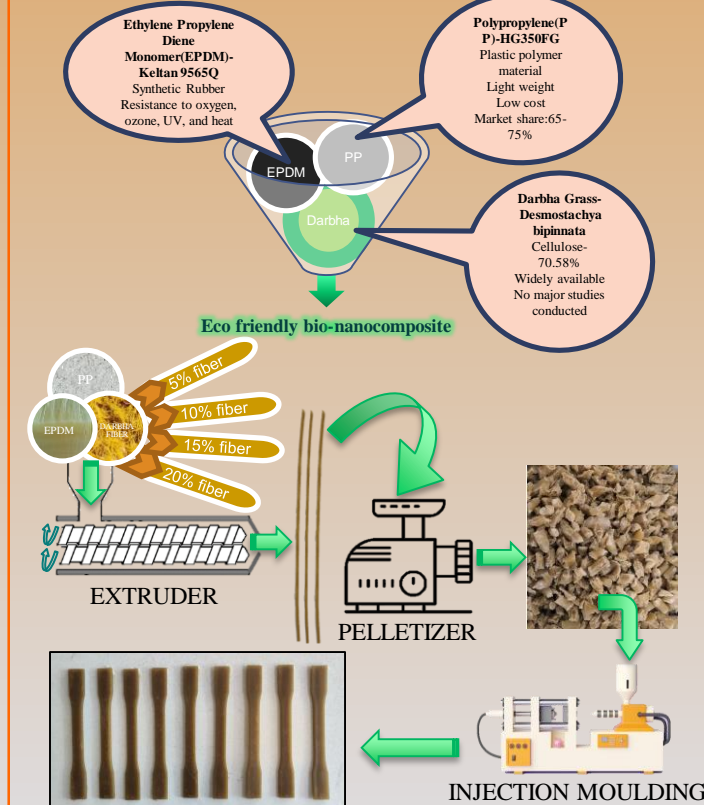
Internal Guide: Dr. Praveen K.M, Prof. Rony Thomas Murickan

External Guide: Dr. Neetha John (Central Institute of Plastics and Technology(CIPET))

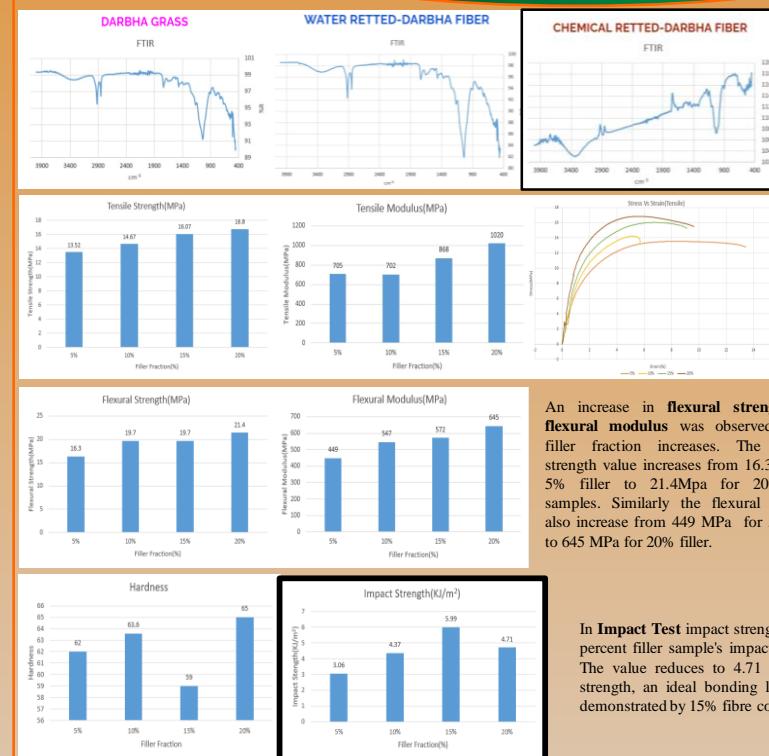
PROBLEM DESCRIPTION

- Polypropylene(PP) is a light weight plastic polymer which has a market share of 65-75% due to its excellent properties applicable in many applications.
- But Polypropylene has low impact strength.
- On mixing PP with an elastomer its impact strength is found to increase.
- Tensile strength decreases on mixing with the elastomer.
- With a better elastomer and ternary fiber material we can produce a composite with high strength and tensile properties
- A novel fiber from Darbha plants (Darbha fiber) with excellent tensile properties has been identified to be used as the ternary phase

METHODOLOGY



RESULTS



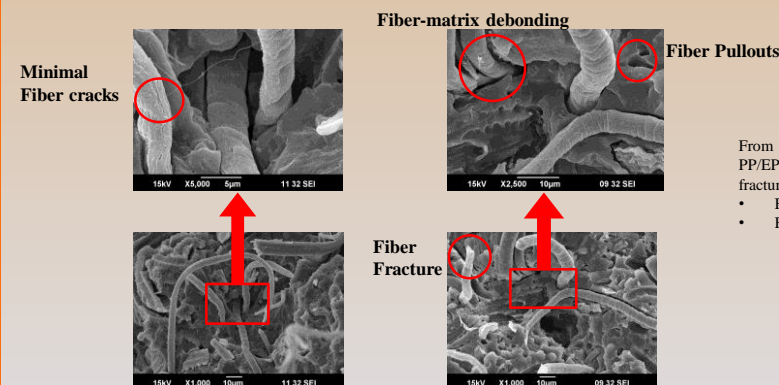
No indication of the formation of Darbha fiber using water retting process after 21 days, thus the darbha fiber obtained from **Chemical retting** after 24 hours is used for further mechanical testing after blending with PP/EPDM

The **Tensile strength Vs Filler Fraction** shows that when the fibre content rises, the tensile strength increases as well. The tensile strength increases from 13.52 MPa at 5% fibre content to 16.8 MPa at 20% fibre content. In **Tensile Modulus Vs Filler Fraction** graph, increase in fibre results in a rise in tensile modulus. From **Stress Vs Strain**, as the amount of fibre grows, stress increases.

An increase in **flexural strength** and **flexural modulus** was observed as the filler fraction increases. The flexural strength value increases from 16.3Mpa for 5% filler to 21.4Mpa for 20% filler samples. Similarly the flexural modulus also increase from 449 MPa for 5% filler to 645 MPa for 20% filler.

The general trend followed in case of **hardness test** is increase in hardness with increase in fibre content. This stays true for 5% with 62 N/mm², 10% with 63.6 N/mm² and 20% with 65 N/mm². For 15% filler fraction the hardness value is found to be decreasing this may be due to fibre agglomeration or improper mixing.

In **Impact Test** impact strength increases as the fibre content increases. The 15 percent filler sample's impact intensity rises from 3.06 KJ/m² to 5.99 KJ/m². The value reduces to 4.71 KJ/m² for the 20% sample. For strong impact strength, an ideal bonding level is necessary, which in our investigation is demonstrated by 15% fibre content.



From the Scanning Electron Microscopy(SEM) of PP/EPDM/15% Darbha fiber, it is evident that the fracture propagation is mainly due to:

- Fiber-pull outs
- Fiber-matrix debonding

CONCLUSIONS

- Successful fabrication of the Darbha fiber reinforced thermoplastic elastomeric composite has been done by injection moulding
- The tensile, Impact, Hardness and flexural properties are found to increase with increase in fiber content
- It was found from the study that the sample with 15% fiber content showed the highest impact resistance.
- Properties like tensile, impact and flexural strength is found to be greatly affected by void content.
- SEM results shows minor fiber cracks, fiber pullouts and debonding in some regions.
- Possible future work can be carried out by selecting a suitable bonding material.

FUTURE WORK

- **Sound absorption**-Darbha grass possesses greater sound absorption properties with NRC(Noise Reduction Coefficient) of 8.5
- **Radiation shielding**- Darbha grass shows the ability of shielding from X-Ray radiation
- Use of **compatibilizers** in the surface treatment of darbha fiber for better compatibility
- **Supercapacitor**- Darbha grass has good electrochemical properties and can help in creating a super-capacitor with excellent energy density and power density

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