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CAE Tensile Analysis of Fiber Reinforced Polymers(FRP)

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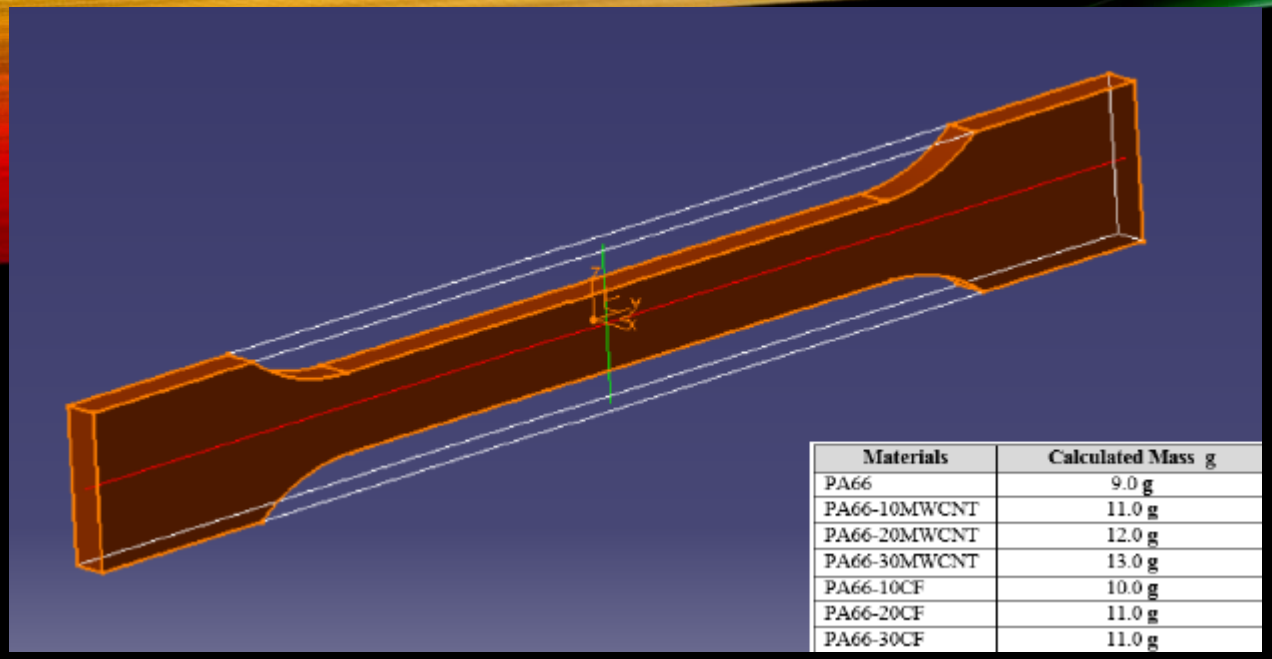
ABSTRACT.

Fiber reinforced polymer (FRP) composites can play a role in vehicle light-weighting, due to their excellent specific strength and stiffness [1]. Simulations were evaluated to verify the influence of the filler in polymer matrix, by checking the differences in weight, density and maximum limit on tensile analysis(MPa) for each polymer composite (PA-MWCNT & PA-CF). Fiber reinforced polymer (FRP) composites were incorporated at different loadings of 10 wt. %., 20 wt. %., and 30 wt. %. Statistical Analysis results, reveals that high tensile limit has been achieved, when the addition of 30 wt. % of CF filler in the PA66 polymer matrix has been added.

KEYWORDS.

MWCNT, Carbon fiber, CAE, Reinforced Polymers, Mechanical performance.



Materials	Calculated Mass g
PA66	9.0 g
PA66-10MWCNT	11.0 g
PA66-20MWCNT	12.0 g
PA66-30MWCNT	13.0 g
PA66-10CF	10.0 g
PA66-20CF	11.0 g
PA66-30CF	11.0 g

Figure.1: Calculated Mass (g) in Catia-V5, measured with inertia tool, for each composite material

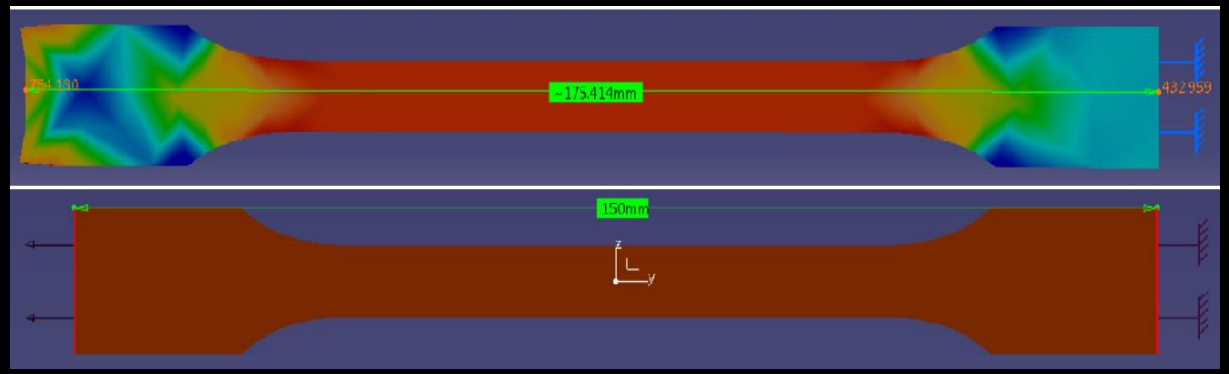


Figure 2: Test specimen view before (150 cm length) and after (175.4 cm length) tensile simulation.

Tensile Simulation tests were conducted on ISO527/2 for each type of specimen with CATIA V5, using Analysis & Simulation → General Structural Analysis Tool.

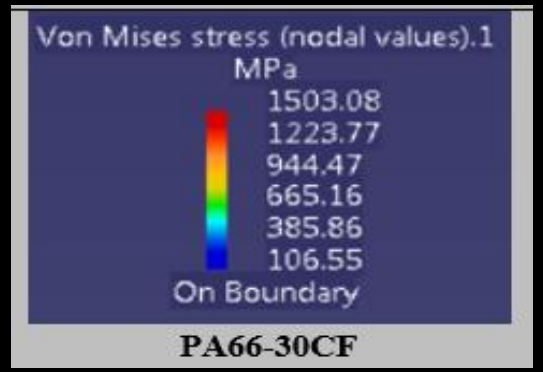


Figure 3:
Minimum & Maximum Stress limit PA66-30CF - volume distortion energy density and state of stress.

CONCLUSION

After completion of all CAE Tensile Analysis, it was observed, that adding 30.0 wt. % CF (carbon fibre) filler in the polymer matrix, the Maximum Stress limit has been increased significantly and improved material properties. A physical study will be conducted in the future, in order to confirm and to complete the entire case of this study.

THANK YOU FOR YOUR ATTENTION!

REFERENCES

[1] Influence of interfacial interactions on the mechanical behavior of hybrid composites of polypropylene / short glass fibers / hollow glass beads. Polymer Testing. https://doi.org/10.1016/j.polymertesting.2020.106418