STUDY OF MECHANICAL PROPERTIES OF POLYPHENELENE SULPHIDE (PPS) COMPOSITE WITH DIFFERENT FILLER MATERIAL.

Ms.Snehal R. Walzade[1], Prof D.S. Galhe.[2]

[1] *PG Student, Mechanical Engineering Department, Jaihind College of Engineering,Kuran, Maharashtra, India.*

[2] *Mechanical Engineering Department, Jaihind College of Engineering,Kuran, Maharashtra, India.*

ABSTRACT

This work describes composite materials fabrication was carried out and their compressive and shear properties was tested. Three types of materials were studied: first PPS, PPS with 30 % glass fiber, and second,PPS with 30 % carbon fiber. Tests were performed on the universal testing machine. The specimens are fabricated by using micro-compounder with micro injection molding machine. As a result of experimental tests, it was established that polymer composite with poly-phenylene sulphide matrix, carbon fibers and glass fiber exhibit good compression and shear properties. The effect on the compression and shear nature of PPS polymer composites has been improved, with addition of 30% Glass Fiber (GF) and 30% Carbon Fiber (CF). It is found that the reinforcing and toughening effects of the PPS hybrid composites are increased by adding 30% GF and 30% CF.The tensile strength, tensile strain, young's modulus and energy at maximum load of these composites increased non-linearly with the addition of the 30% GF and 30% CF.

Keyword: - *composites, filler material, Polyphenelenesulphide, Glass Fiber, Carbon Fiber.*

1. INTRODUCTION

Polyphenylene sulfide : Polyphenylene sulphide (PPS) composites are widely used especially in automotive main parts due to their easy process ability most automotive parts (especially the outer parts, like sun -roof, etc.) would either be exposed to natural weathering or to more extreme environments. It is an engineering thermoplastics, It possesses high temperature resistance, excellent electrical and mechanical properties.PPS has been widely used in corrosion resistant coating, mechanical parts, electric and electronic apparatus. PPS has a glass transition temperature of 80–90oC and melting temperature of 2800C. PPS has good dimensional stability, high strength, high modulus, chemical and fatigue resistance, and can be metal substitute engineering plastic. Glassmakers throughout history have experimented with glass fibers, but mass manufacture of glass fiber was only made possible with the invention of finer machine tooling. Various researchers have investigated the effect of nano-inclusions on various polymers and also discussed the properties of Polyphenylene sulfide and other polymers.

2. PROBLEM DEFINITION

The high wear rate is a serious problem in a large number of industrial applications. compressor piston rings and bearings. Meanwhile to meet the combination of light weight and high strength demands polymer-based materials are increasingly applied in many industries.

3. MATERIALS AND METHODS

This chapter describes the details of processing of the composites and the experimental procedures followed for their characterization and tribological evaluation. The raw materialsused in this work are

A) Polyphenylene Sulphide (PPS)

B) Glass Fiber (GF)

C) Carbon Fiber (CF)

Processing of The Composites The following grade of composites material used for specimen preparation from following source. PPS Neat (unfilled) (Trade name Perfect Polymer, Pune) PPS with adding Glass Fiber and Carbon Fiber (Trade name Perfect Polymer, Pune) Pin Size - The specimens for wear test were prepared of diameter 12 mm and height 30 mm. For hardness test specimens were prepared of diameter 12 mm and height 30 mm.

Table 3.1 Designation of Composites

Specimen	Compositions
C1	PPS 100%
C2	PPS + 30% Glass Fiber
C3	PPS + 30% Carbon Fiber

4. EXPERIMENTAL SETUP

Fig. 4.1 Experimental setup (Universal Testing Machine).

5. OBSERVATIONS

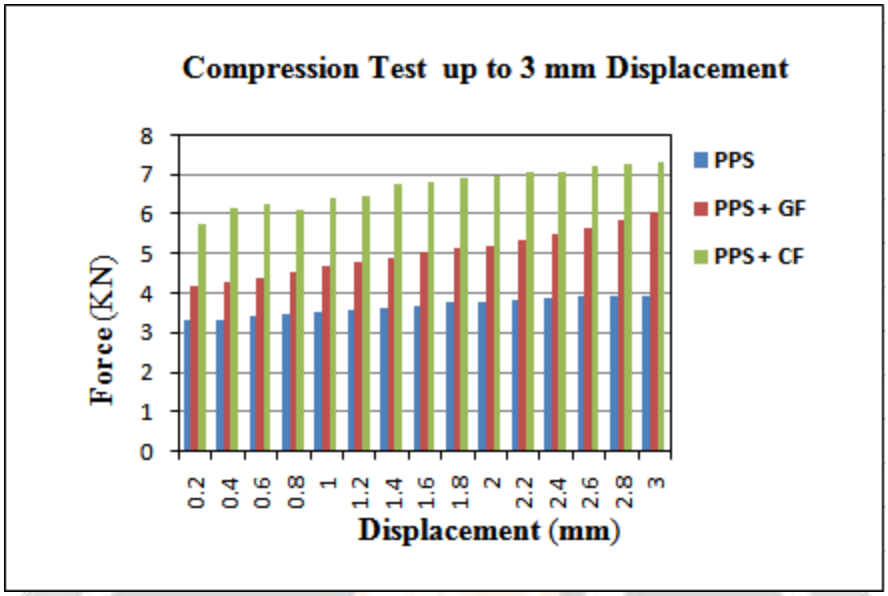
Table 5.1 Compression Test Reading for PPS, PPS with 30% GF Filled and PPS with 30% CF Filled

Displacement	Force (KN)		
	PPS	PPS + GF	PPS + CF
0.2	3.32	4.18	5.76
0.4	3.36	4.30	6.20
0.6	3.44	4.41	6.60
0.8	3.48	4.54	6.14
1.0	3.54	4.71	6.40
1.2	3.60	4.79	6.46
1.4	3.66	4.92	6.74
1.6	3.70	5.07	6.80
1.8	3.78	5.17	6.90
2.0	3.8	5.23	6.94
2.2	3.86	5.35	7.04
2.4	3.92	5.50	7.06
2.6	3.94	5.68	7.18
2.8	3.96	5.86	7.26
3.0	3.96	6.09	7.28

Table 5.2 Shear Test Reading for PPS, PPS with 30% GF Filled and PPS with 30% CF Filled

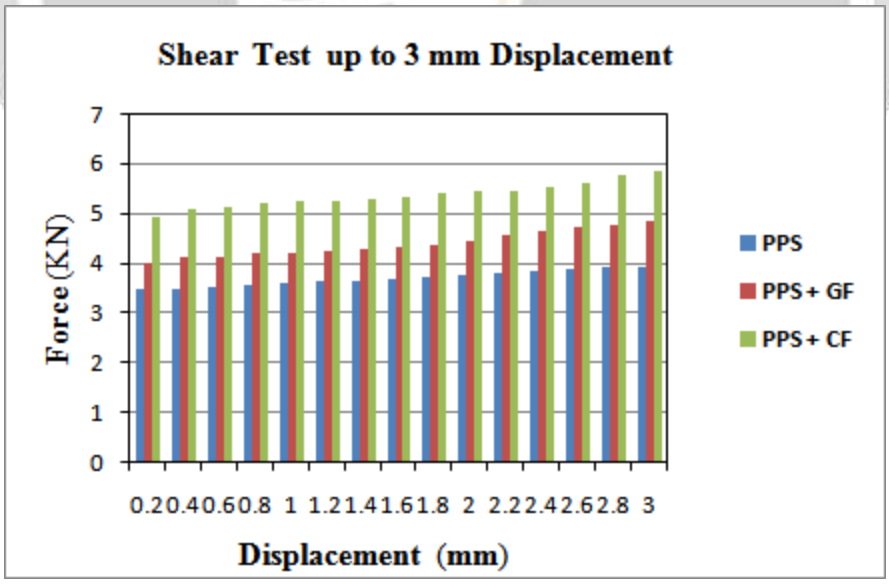
Displacement	Force (KN)		
	PPS	PPS + GF	PPS + CF
0.2	3.45	4	4.9
0.4	3.47	4.09	5.05
0.6	3.51	4.12	5.11
0.8	3.55	4.18	5.19
1.0	3.59	4.2	5.21
1.2	3.61	4.24	5.23
1.4	3.64	4.28	5.28
1.6	3.68	4.31	5.32
1.8	3.71	4.36	5.39
2.0	3.75	4.41	5.43
2.2	3.79	4.53	5.45
2.4	3.81	4.62	5.51
2.6	3.86	4.69	5.60
2.8	3.90	4.75	5.75
3.0	3.92	4.82	5.91

6. RESULTS AND DISCUSSION



Graph 6.1 Force Vs Displacement For Compression Test

The different materials specimen are test under compression test then it is found that constant load are show up to 3 mm displacement after this there is variation coming in load so PPS material compress up to 3 mm then force take 3.96 KN ,PPS with 30% GF for 3 mm displacement compression take 6.09 KN load, PPS with 30 % CF for 3 mm displacement compression take 7.28 KN load.



Graph 6.2 Force Vs Displacement for Shear Test

The different materials specimen are tested under the shear test then result is found that pure PPS take 3.92 KN load then 3 mm displacement are take place but under same condition PPS with 30% Glass Fiber take 4.82 KN load for 3 mm displacement and PPS with 30% Carbon Fiber take 5.81 KN load for 3 mm displacement. Up 3 mm displacement constant load is shown for the PPS and after 3 mm displacement there is variation are occur in load

and finally PPS material is break after 7.2 mm displacement and that time load on display show 6.02 KN, PPS with Glass Fiber is break after 5 mm displacement and that time load on display show 6.58 KN and PPS with Carbon Fiber is break after 4.6 mm displacement and that time load on display show 7.26 KN.

7. CONCLUSION

The different materials specimen are test under compression test and shear test then it is found that PPS compress up to 3mm then force take 3.96 KN and when filler materials are added then it takes greater load to compression. Hence improving the property of PPS material with the help of glass fiber and carbon fiber as a filler material. Similarly for shear test pure PPS take small load but PPS with Glass fiber and Carbon Fiber takes greater load foe same displacement.

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	**Miss Walzade Snehal Rajendra** is doing the Master of Engineering in Jaihind College of Engineering Kuran, Junnar. In Design Mechanical Department.
	**Prof. Galhe D.S.** is Working as a CEO and Project Coordinator in Jaihind College of Engineering, Kuran, Junnar. He has Complete Degree in Goverment College of Engineering, Pune