DEVELOPMENT OF ZA/ZrB_2 INSITU COMPOSITE FOR TRIBOLOGICAL APPLICATIONS

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By

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CHAPTER 8

MAJOR CONCLUSIONS AND SCOPE OF WORK

8.1 MAIN CONCLUSIONS

- High wear resistance and high COF of composite in dry working conditions with high vol.% of reinforcement suggests its suitability in brake applications.
- High wear resistance and low COF of the material, even at higher applied loads and for larger sliding distances in lubricating conditions with high vol.% of reinforcement makes is suitable for automobile bearing applications.
- RSM and ANN can be very useful in minimizing redundant experiments which could save overall time and resource consumptions.

8.2 SCOPE OF THE WORK

To understand the scope of the present work, the comparative study of tribological properties with different materials which are being used in various applications has been done and given in Tables 8.1 and 8.2.

Table 8.1 Comparison of wear of present study with previous work with emphasis as automobile materials

Material	Specific Wear rate (g/Nm) in dry sliding condition	Specific Wear rate (g/Nm) in Lubricating sliding condition	References	Applications
Zn-Al/9 vol.% ZrB_2	1.02×10^{-7}	2.28×10^{-9}	Present work	In Automobile sector
M50 Steel with 1.5 wt% graphene (MGC)	$\sim7.5\times10^{-7}$ Prepared using laser additive manufacturing	-	X. Liu et al., (2018)	Manufacture aircraft bearings
	16.9×10^{-7} Prepared using spark plasma sintering			
WM-2	$\sim6.5\times10^{-7}$	-	A. Zerene et al., (2007)	Bearing material in automotive industry
WM-5	$\sim35\times10^{-7}$			
Journal bearing material (Brass)	-	$\sim1.38\times10^{-8}$	S. Basker et al., (2014)	Journal bearing material
CuPb24Sn as bearing alloy	-	$\sim1.9\times10^{-8}$	Hulin et al., 2020	Bearing applications

Table 8.2 Comparison of COF of present study with previous work with emphasis as automobile materials

Material	**COF In Dry wear condition**	**COF In lubrication wear condition**	**References**	**Applications**
Zn-Al/9 vol.% ZrB_2	0.526 - 0.648	0.023-0.031	Present work	In Automobile sector
M50 Steel with 1.5 wt% graphene (MGC)	~0.5- 0.7 Prepared using laser additive manufacturing	-	X. Liu et al., (2018)	Manufacture aircraft bearings
	~0.62-0.82 prepared using spark plasma sintering			
WM-2	~0.40 - 0.62	-	A. Zerene et al., (2007)	Bearing material in automotive industry
WM-5	~0.28 - 0.44			
Journal bearing material (Brass)	-	~0.05-0.09	S. Basker et al., (2014)	Journal bearing material
CuPb24Sn as bearing alloy	-	~0.029-0.037	Hulin et al., 2020	Bearing applications

It is clear from Fig 3.1 and Tables 8.1 & 8.2 that in present study ZA/ 9 vol.% ZrB_2 *insitu* composite exhibit higher/comparable strength to weight ratio and lower specific wear rate while higher/comparable COF in dry sliding condition and lower COF in lubricating sliding condition with previous work specially materials used for automobile applications. This indicates its suitability in tribological applications such as bush, bearings and brake parts.