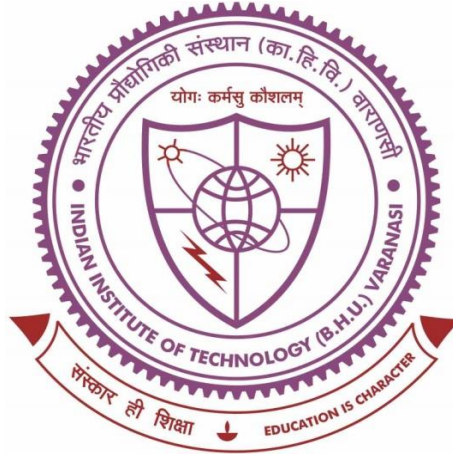


# TRIBOLOGICAL PERFORMANCE OF COPPER-GRAPHITE- TiC SELF LUBRICATING COMPOSITES



Thesis submitted in partial fulfilment for the  
Award of Degree

**Doctor of Philosophy**

By

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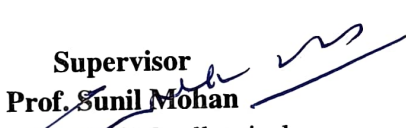
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*I would like to dedicate  
this  
Thesis*

*To my*

*Beloved Mother  
Late. Smt. Shyama Devi*



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Ankit

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## LIST OF FIGURES

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|   |    |
|---|----|
| <b>Fig. 1.1</b> Showing matrices used in composites .....   | 3  |
| <b>Fig. 1.2</b> Synthesis steps of Powder Metallurgy route.....   | 11 |
| <b>Fig. 1.3</b> Milling process schematic.....  | 13 |
| <b>Fig. 2.1</b> (a) PM400 milling machine, (b) Compaction die and punch and (c) Sintered sample.....  | 43 |
| <b>Fig. 3.1</b> Sintered density of Cu-5wt.% Gr sample with sintering time and temperature.....   | 54 |
| <b>Fig. 3.2</b> Hardness values of Cu-5wt.% Gr sample with sintering time and temperature. ....   | 55 |
| <b>Fig. 3.3</b> XRD pattern of Cu and composites .....  | 56 |
| <b>Fig. 3.4</b> Green density, sintered density and porosity % of Cu and composites .....   | 57 |
| <b>Fig. 3.5</b> Optical micrographs of sintered composites (a) Cu-Gr, (b) T1.5, (c) T3.0 and (d) T4.5.....  | 58 |
| <b>Fig. 3.6</b> Average grain size of Cu matrix in sintered composites.....   | 58 |
| <b>Fig. 3.7</b> FE-SEM images of T4.5 composite powder after (a) 1 hour milling, (b) 2 hours milling, (c) 3 hours milling, (d) 4 hours milling, (e) 5 hours milling and (f) FE-SEM image of Gr particle at higher magnification. .... | 60 |
| <b>Fig. 3.8</b> EDS element mapping of Cu and C elements in Cu-Gr composite.....  | 62 |
| <b>Fig. 3.9</b> EDS element mapping of Cu, C and Ti elements in T1.5 composite .....  | 63 |
| <b>Fig. 3.10</b> EDS element mapping of Cu, C and Ti elements in T4.5 composite .....   | 64 |
| <b>Fig. 3.11</b> Behaviour of pure Cu and composites for (a) Vickers hardness and (b) Compressive strength .....  | 65 |

|  |    |
|--|----|
| <b>Fig. 4.1</b> Influence of sliding distance on wear volume at various applied loads (a) 10 N (b) 20 N (c) 30 N (d) 40 N.....   | 68 |
| <b>Fig. 4.2</b> Influence of sliding distance on COF at various applied loads (a) 10 N (b) 20 N (c) 30 N (d) 40 N.....   | 69 |
| <b>Fig. 4.3</b> SEM images of worn surface of T3.0 composite at load of 30 N and sliding distance of (a) 1000 m (b) 2000 m (c) 3000 m (d) 4000 m .....   | 70 |
| <b>Fig. 4.4</b> AFM image of T3.0 composite at 30 N load and sliding distance of (a) 1000 m (b) 2000 m (c) 3000 m (d) 4000 m .....   | 71 |
| <b>Fig. 4.5</b> Influence of sliding velocity on wear rate at sliding distance of 3000 m and different applied loads (a) 10 N (b) 20 N (c) 30 N (d) 40 N.....                                    | 72 |
| <b>Fig. 4.6</b> Influence of sliding velocity on wear rate at sliding distance of 3000 m and different applied loads (a) 10 N (b) 20 N (c) 30 N (d) 40 N.....                                    | 73 |
| <b>Fig. 4.7</b> SEM images of worn surface of T3.0 composite at load of 30 N and 3000 m of sliding distance and varying sliding velocity of (a) 0.75 m/s (b) 1.5 m/s (c) 2.25 m/s (d) 3 m/s..... | 74 |
| <b>Fig. 4.8</b> Energy-dispersive spectroscopy (EDS) element mapping of worn surface at 30 N load of Cu-Gr at (a) 0.75 m/s velocity and (b) 1.5 m/s velocity .....                               | 75 |
| <b>Fig. 4.9</b> Energy-dispersive spectroscopy (EDS) element mapping of worn surface at 30 N load of T3.0 composite at (a) 0.75 m/s velocity and (b) 1.5 m/s velocity.....                       | 76 |
| <b>Fig. 4.10</b> AFM image of T3.0 composite at 30 N load and 3000 m of sliding distance and sliding speed of (a) 0.75 m/s (b) 1.5 m/s (c) 2.25 m/s (d) 3 m/s.....                               | 77 |
| <b>Fig. 4.11</b> Influence of applied load on wear rate at sliding distance of (a) 1000 m (b) 2000 m (c) 3000 m (d) 4000 m and (e) Specific wear rate at 3000 m .....                            | 79 |
| <b>Fig. 4.12</b> Influence of applied load on COF at sliding distance of (a) 1000 m (b) 2000 m (c) 3000 m (d) 4000 m .....   | 80 |

|   |    |
|---|----|
| <b>Fig. 4.13</b> SEM images of worn surface of T3.0 composite at 3000 m of sliding distance and applied load of (a) 10 N (b) 20 N (c) 30 N (d) 40 N.....                                | 81 |
| <b>Fig. 4.14</b> AFM image of T3.0 composite at 3000 m of sliding distance and applied load of (a) 10 N (b) 20 N (c) 30 N (d) 40 N .....  | 82 |
| <b>Fig. 4.15</b> Influence of Gr and TiC content on wear rate at constant sliding velocity of 1.5 m/s and different sliding distance of (a) 1000 m (b) 2000 m (c) 3000 m (d) 4000 m.... | 83 |
| <b>Fig. 4.16</b> Influence of Gr and TiC content on COF at constant sliding velocity of 1.5 m/s and different sliding distance of (a) 1000 m (b) 2000 m (c) 3000 m (d) 4000 m.....      | 84 |
| <b>Fig. 4.17</b> Influence of Gr and TiC content on wear coefficient at constant sliding distance of 3000 m.....  | 86 |
| <b>Fig. 4.18</b> SEM images of worn surface at 30 N load and 3000 m of sliding distance for (a) Cu and composites (b) Cu-Gr, (c) T1.5, (d) T3.0 and (e) T4.5 .....                      | 88 |
| <b>Fig. 4.19</b> AFM images of worn surface at 30 N load and 3000 m of sliding distance for (a) Cu and composites (b) Cu-Gr, (c) T1.5, (d) T3.0 and (e) T4.5 .....                      | 89 |
| <b>Fig. 5.1</b> Influence of sliding distance on wear volume at various applied loads (a) 10 N (b) 30 N (c) 50 N (d) 70 N.....  | 94 |
| <b>Fig. 5.2</b> Influence of sliding distance on COF at various applied loads (a) 10 N (b) 30 N (c) 50 N (d) 70 N .....   | 95 |
| <b>Fig. 5.3</b> SEM images of worn surface of T3.0 composite at load of 70 N and sliding distance of (a) 2000 m (b) 4000 m (c) 6000 m (d) 8000 m.....                                   | 96 |
| <b>Fig. 5.4</b> AFM image of T3.0 composite at 70 N load and sliding distance of (a) 2000 m (b) 4000 m (c) 6000 m (d) 8000 m.....   | 97 |
| <b>Fig. 5.5</b> Influence of sliding velocity on wear rate at sliding distance of 8000 m and various applied loads (a) 10 N (b) 30 N (c) 50 N (d) 70 N .....                            | 98 |

|   |     |
|---|-----|
| <b>Fig. 5.6</b> Influence of sliding velocity on COF at sliding distance of 8000 m and various applied loads (a) 10 N (b) 30 N (c) 50 N (d) 70 N.....   | 99  |
| <b>Fig. 5.7</b> SEM image of worn surface of T3.0 composite at 70 N load and 8000 m of sliding distance and sliding velocity of (a) 0.75 m/s (b) 1.5 m/s (c) 2.25 m/s (d) 3 m/s .....                               | 100 |
| <b>Fig. 5.8</b> AFM image of T3.0 composite at 70 N load and 8000 m of sliding distance and sliding velocity of (a) 0.75 m/s (b) 1.5 m/s (c) 2.25 m/s (d) 3 m/s .....   | 101 |
| <b>Fig. 5.9</b> Influence of applied load on wear rate at sliding velocity of 3 m/s and sliding distance of (a) 2000 m (b) 4000 m (c) 6000 m (d) 8000 m and (e) Specific wear rate at 6000 m sliding distance ..... | 102 |
| <b>Fig. 5.10</b> Influence of applied load on COF at sliding velocity of 3 m/s and sliding distance of (a) 2000 m (b) 4000 m (c) 6000 m (d) 8000 m .....  | 103 |
| <b>Fig. 5.11</b> SEM images of worn surface of T3.0 composite at 8000 m of sliding distance and applied load of (a) 10 N (b) 30 N (c) 50 N (d) 70 N .....   | 104 |
| <b>Fig. 5.12</b> AFM image of T3.0 composite at 8000 m of sliding distance and applied load of (a) 10 N (b) 30 N (c) 50 N (d) 70 N .....  | 105 |
| <b>Fig. 5.13</b> Influence of Gr and TiC content on wear rate at constant sliding velocity of 3 m/s and different sliding distance of (a) 2000 m (b) 4000 m (c) 6000 m (d) 8000 m ..                                | 106 |
| <b>Fig. 5.14</b> Influence of Gr and TiC content on COF at constant sliding velocity of 3 m/s and different sliding distance of (a) 2000 m (b) 4000 m (c) 6000 m (d) 8000 m .....                                   | 108 |
| <b>Fig. 5.15</b> Influence of Gr and TiC content on wear coefficient at constant sliding distance of 8000 m .....   | 109 |
| <b>Fig. 5.16</b> SEM images of worn surface at 70 N load and 8000 m of sliding distance for (a) Cu and composites (b) Cu-Gr, (c) T1.5, (d) T3.0 and (e) T4.5 .....  | 110 |

|  |     |
|--|-----|
| <b>Fig. 5.17</b> AFM images of worn surface at 70 N load and 8000 m of sliding distance for (a) Cu and composites (b) Cu-Gr, (c) T1.5, (d) T3.0 and (e) T4.5 ..... | 111 |
| <b>Fig. 6.1</b> 2D and 3D- surface and contour plots showing wear rate variation with applied load and sliding distance for (a) T1.5 (b) T3.0 (c) T4.5.....        | 123 |
| <b>Fig. 6.2</b> 2D and 3D- surface and contour plots for wear rate (a) applied load vs wt.% of TiC and (b) sliding distance vs wt.% of TiC .....                   | 124 |
| <b>Fig. 6.3</b> 2D and 3D- surface and contour plots showing COF variation with applied load and sliding distance for (a) T1.5 (b) T3.0 (c) T4.5 .....             | 126 |
| <b>Fig. 6.4</b> 2D and 3D- surface and contour plots for COF (a) applied load vs wt.% of TiC and (b) sliding distance vs wt.% of TiC .....                         | 127 |
| <b>Fig. 6.5</b> Variation of experimental and predicted values and normal probability for residuals of wear rate.....  | 128 |
| <b>Fig. 6.6</b> Variation of experimental and predicted values and normal probability for residuals of COF.....  | 129 |
| <b>Fig. 6.7</b> Influence of individual factors on wear rate and COF.....  | 130 |
| <b>Fig. 6.8</b> Influence of individual factors on wear rate and COF.....  | 131 |
| <b>Fig. 6.9</b> 2D and 3D- surface and contour plots showing wear rate variation with applied load and sliding distance for (a) T1.5 (b) T3.0 (c) T4.5 .....       | 139 |
| <b>Fig. 6.10</b> 2D and 3D- surface and contour plots for wear rate (a) applied load vs wt.% of TiC and (b) sliding distance vs wt.% of TiC .....                  | 140 |
| <b>Fig. 6.11</b> 2D and 3D- surface and contour plots showing COF variation with applied load and sliding distance for (a) T1.5 (b) T3.0 (c) T4.5 .....            | 141 |
| <b>Fig. 6.12</b> 2D and 3D- surface and contour plots for COF (a) applied load vs wt.% of TiC and (b) sliding distance vs wt.% of TiC .....                        | 142 |

**Fig. 6.13** Variation of experimental and predicted values and normal probability for residuals of wear rate .....143

**Fig. 6.14** Variation of experimental and predicted values and normal probability for residuals of COF .....144

**Fig. 6.15** Influence of individual factors on the wear rate and COF .....145

**Fig. 6.16** Influence of individual factors on wear rate and COF .....146

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## LIST OF TABLES

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---

|  |     |
|--|-----|
| <b>Table 1.1</b> Comparison of literature of copper graphite composite.....                            | 36  |
| <b>Table 2.1</b> Properties of the materials used in the current study .....                           | 41  |
| <b>Table 2.2</b> Samples with different composition.....   | 44  |
| <b>Table 2.3</b> Characteristics of SAE20W40 motor oil .....   | 48  |
| <b>Table 2.4</b> RSM input parameters for the composites under dry sliding condition .....             | 50  |
| <b>Table 2.5</b> RSM input parameters for the composites under lubricating sliding condition.....      | 51  |
| <b>Table 4.1</b> Topographical parameters of all compositions .....                                    | 91  |
| <b>Table 5.1</b> Topographical parameters of all compositions.....                                     | 112 |
| <b>Table 6.1</b> Input factors and levels for the composites under dry sliding condition.....          | 116 |
| <b>Table 6.2</b> Design of experiment with input factors and responses .....                           | 116 |
| <b>Table 6.3</b> ANOVA for optimisation of wear rate .....   | 118 |
| <b>Table 6.4</b> Statistics model summary of wear rate .....   | 119 |
| <b>Table 6.5</b> ANOVA for optimisation of COF .....   | 120 |
| <b>Table 6.6</b> Statistics model summary of COF .....   | 121 |
| <b>Table 6.7</b> Experimental and predicted values of the model for optimal wear rate and COF .....    | 132 |
| <b>Table 6.8</b> Input factors and levels for the composites under lubricating sliding condition ..... | 133 |
| <b>Table 6.9</b> Design of experiment with input factors and responses .....                           | 133 |
| <b>Table 6.10</b> Statistics model summary of wear rate .....  | 134 |
| <b>Table 6.11</b> Statistics model summary of COF .....  | 135 |
| <b>Table 6.12</b> ANOVA for optimisation of wear rate .....  | 136 |

**Table 6.13** ANOVA for optimisation of COF .....136

**Table 6.14** Experimental and predicted values of the model for optimal wear rate and COF.....147

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## LIST OF SYMBOLS

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### 1. Abbreviation

|                    |                         |
|--------------------|-------------------------|
| Cu                 | Copper                  |
| Gr                 | Graphite                |
| Ti                 | Titanium                |
| TiC                | Titanium carbide        |
| Fe                 | Iron                    |
| Zn                 | Zinc                    |
| Ni                 | Nickel                  |
| Cr                 | Chromium                |
| W                  | Tungsten                |
| O                  | Oxygen                  |
| N                  | Newton                  |
| m                  | meter                   |
| cm                 | Centimetre              |
| mm                 | millimetre              |
| $\mu\text{m}$      | Micron                  |
| cc                 | Cubic centimetre        |
| gm                 | gram                    |
| $\rho$             | Density                 |
| Wt.%               | Weight percentage       |
| MPa                | Mega Pascal             |
| WR                 | Wear rate               |
| COF                | Coefficient of friction |
| $^{\circ}\text{C}$ | Degree centigrade       |
| s                  | Second                  |
| h                  | Hour                    |

## 2. Acronym

|      |  |
|------|--|
| MMCs | Metal matrix composites                    |
| PMCs | Polymer matrix composites                  |
| CMCs | Ceramic matrix composites                  |
| ASTM | American society for testing and materials |
| VHN  | Vickers's hardness number                  |
| RSM  | Response Surface Methodology               |
| CCD  | Centre Composite Design                    |
| DOE  | Design of Expert                           |
| ANN  | Artificial Neural Network                  |
| XRD  | X-ray Diffraction                          |
| OM   | Optical microstructure                     |
| SEM  | Scanning Electron Microscopy               |
| EDS  | Energy Dispersive X-ray Spectroscopy       |
| TEM  | Transmission Electron Microscopy           |
| AFM  | Atomic force microscope                    |