# LIST OF FIGURES

## CHAPTER 1

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>Composite materials in AV-8B Airframe</td>
<td>29</td>
</tr>
<tr>
<td>1.2</td>
<td>Applications of Discontinuously Reinforced Aluminium composites</td>
<td>31</td>
</tr>
<tr>
<td>1.3</td>
<td>P100/6061 Al high-gain antenna wave guides/boom for the Hubble Space Telescope</td>
<td>34</td>
</tr>
<tr>
<td>1.4</td>
<td>Cast SiC_p/Al attachment fittings - multi-inlet fitting for a truss node</td>
<td>34</td>
</tr>
<tr>
<td>1.5</td>
<td>Cast fitting brazed to a Gr/Al tube</td>
<td>35</td>
</tr>
<tr>
<td>1.6</td>
<td>P100/AZ91C Gr/Mg tubes produced by the vacuum-assist casting process</td>
<td>35</td>
</tr>
</tbody>
</table>

## CHAPTER 4

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page No</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1</td>
<td>Composite melting furnace</td>
<td>57</td>
</tr>
<tr>
<td>4.2</td>
<td>Effect of various loads on wear index for M1</td>
<td>59</td>
</tr>
<tr>
<td>4.3</td>
<td>Effect of various loads on wear index for M2</td>
<td>60</td>
</tr>
<tr>
<td>4.4</td>
<td>Effect of various loads on wear index for M3</td>
<td>60</td>
</tr>
<tr>
<td>4.5</td>
<td>Tension test specimen</td>
<td>62</td>
</tr>
<tr>
<td>4.6</td>
<td>Stress-Strain curve for M1</td>
<td>63</td>
</tr>
<tr>
<td>4.7</td>
<td>Stress-Strain curve for M2</td>
<td>64</td>
</tr>
<tr>
<td>4.8</td>
<td>Stress-Strain curve for M3</td>
<td>64</td>
</tr>
<tr>
<td>4.9</td>
<td>Microstructure of stir cast specimens with Si, SiO_2, Mg and SiC dispersoids</td>
<td>67</td>
</tr>
<tr>
<td>4.10</td>
<td>Effect of sliding distance on wear</td>
<td>70</td>
</tr>
<tr>
<td>4.11</td>
<td>Effect of load on wear</td>
<td>71</td>
</tr>
</tbody>
</table>
Figure 4.12  Microstructure of stir cast specimens with SiC and flyash dispersoids

CHAPTER 5

Figure 5.1  Flow chart of the powder metallurgy production process
Figure 5.2  Effect of sliding distance on wear
Figure 5.3  Effect of load on wear
Figure 5.4  Microstructure of powder metallurgy specimens with SiC and flyash dispersoids
Figure 5.5  Effect of load on wear index for different specimens with increasing SiC content
Figure 5.6  Microstructure of worn specimens
Figure 5.7  Microstructure of powder metallurgy specimens with SiC, flyash, copper and zinc dispersoids

CHAPTER 6

Figure 6.1  Effect of load on wear rate on the MMC’s with increasing SiC reinforcement.
Figure 6.2  Effect of temperature on wear rate on MMC’s with increasing SiC reinforcement
Figure 6.3  Microstructure of worn out specimens
Figure 6.4  Effect of temperature on UTS
Figure 6.5  Effect of temperature on hardness
Figure 6.6  Microstructure of powder metallurgy specimens
Figure 6.7  Effect of load on wear index, treated at -170° C
Figure 6.8  Effect of load on wear index, treated at 300° C
Figure 6.9  Effect of load on wear index, treated at 770° C
Figure 6.10 Effect of temperature on compressive stress

Figure 6.11 Microstructure of Al 60%, SiC 30%, flyash 10% at different temperatures

Figure 6.12 Microstructure of Al 50%, SiC 40%, flyash 10% at different temperatures

CHAPTER 7

Figure 7.1 Direct effect of grid size of SiC on MRR, TWR and SR when current, pulse duration are at 0 level

Figure 7.2 Direct effect of current on MRR, TWR and SR when grit size of SiC and pulse duration is at level 1

Figure 7.3 Direct effect of pulse duration on MRR, TWR and SR when grit size of SiC and current are at level 1

Figure 7.4 Interaction effect of grit size of SiC and current on MRR when the pulse duration is at 1 level.

Figure 7.5 Interaction effect of grit size of SiC and pulse duration on MRR when the current is at 1 level

Figure 7.6 Interaction effect of grit size of SiC and current on TWR when the pulse duration is at 1 level.

Figure 7.7 Interaction effect of grit size of SiC and pulse duration on TWR when the current is at 1 level.

Figure 7.8 Interaction effect of current and grid size of SiC on SR when pulse duration is at 0 level

Figure 7.9 Interaction effect of the grit size of SiC and pulse duration on SR when the current is at 1 level

Figure 7.10 Direct effect of volume % of SiC on material removal and tool wear when other parameters are at ‘0’ level

Figure 7.11 Direct effect of current on material removal and tool wear when other parameters are at ‘0’ level.
Figure 7.12 Interactive effect of volume % of SiC and pulse duration on MRR1 when current is at ‘0’ level.

Figure 7.13 Interactive effect of volume % of SiC and pulse duration on TWR1 when current is at ‘0’ level.

Figure 7.14 Interactive effect of volume % of SiC and current on MRR2 when pulse duration is at ‘0’ level.

Figure 7.15 Interactive effect of volume % of SiC and current on TWR2 when pulse duration is at ‘0’ level.

Figure 7.16 Direct effect of volume % of SiC on MRR, TWR and SR when compacting pressure, pulse duration and current are at ‘0’ level.

Figure 7.17 Direct effect of compacting pressure on MRR, TWR and SR when volume % of SiC, pulse duration and current are at ‘0’ level.

Figure 7.18 Direct effect of pulse duration on MRR, TWR and SR when volume % of SiC, compacting pressure and current are at ‘0’ level.

Figure 7.19 Direct effect of Current on MRR, TWR and SR when volume % of SiC, compacting pressure and pulse duration are at ‘0’ level.

Figure 7.20 Interaction effect of current and volume % of SiC on MRR when compacting pressure and pulse duration are at ‘0’ level.

Figure 7.21 Interaction effect of compacting pressure and volume % of SiC on MRR when current and pulse duration are at ‘0’ level.

Figure 7.22 Interaction effect of pulse duration and volume % of SiC on MRR when current and compacting pressure are at ‘0’ level.
Figure 7.23 Interaction effect of current and volume % of SiC on TWR when pulse duration and compacting pressure are at ‘0’ level.

Figure 7.24 Interaction effect of compacting pressure and volume % of SiC on TWR when current and pulse duration are at ‘0’ level.

Figure 7.25 Interaction effect of pulse duration and volume % of SiC on TWR when current and compacting pressure are at ‘0’ level.

Figure 7.26 Interaction effect of compacting pressure and volume % of SiC on surface roughness when current and pulse duration are at ‘0’ level.

Figure 7.27 Interaction effect of pulse duration and volume % of SiC on surface roughness when current and compacting pressure are at ‘0’ level.

Figure 7.28 Direct effect of volume % of SiC on MRR and SR

Figure 7.29 Direct effect of treatment temperature on MRR and SR

Figure 7.30 Direct effect of volume % of SiC on TWR

Figure 7.31 Direct effect of treatment temperature on TWR

Figure 7.32 Interaction effect of volume % of SiC and temperature on MRR

Figure 7.33 Interaction effect of treatment time and temperature on MRR

Figure 7.34 Interaction effect of volume % of SiC and temperature on TWR

Figure 7.35 Interaction effect of volume % of SiC and temperature on SR
| Figure 1 | Photograph of the experimental set up for liquid metallurgy | 196 |
| Figure 2 | Photograph of the cryogenic processing set up | 197 |
| Figure 3 | Photograph of electric discharge machine | 198 |
| Figure 4 | Photograph of electric discharge machining | 198 |