the fig below that the composition with 0%SiC+8%$ZrSiO_4$ and 2%SiC+6%$ZrSiO_4$ have high compression strength.

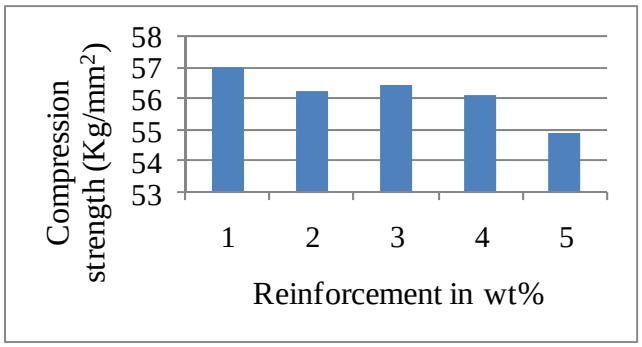


Figure 15: Compression strength for different wt% reinforcement

5.3 Hardness Test Results

The presence of reinforcement particles in the matrix could impede the movement of dislocations since these particles are stronger than the matrix in which they are embedded. it has been observed that the hardness values are high for the matrix with weight percent reinforcement of 2%SiC+6%$ZrSiO_4$ and 4%SiC+4%$ZrSiO_4$. This is also due to high proportion of the hard and brittle phase of the zircon sand in the alloy. The zircon sand addition to the matrix alloy results to elastic and plastic incompatibility due to differences in the coefficient of thermal expansion in the hard reinforcing and soft matrix alloy, which causes high dislocation density. The high dislocation density also contributed to high hardness value.

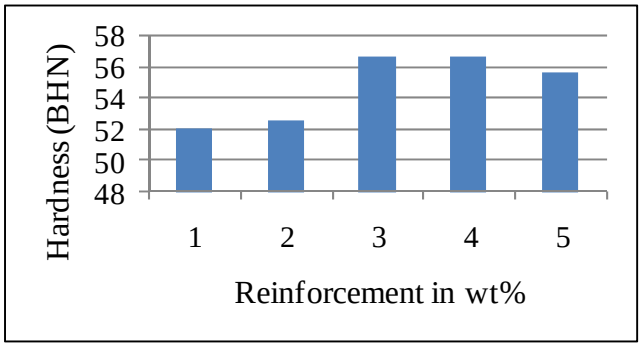
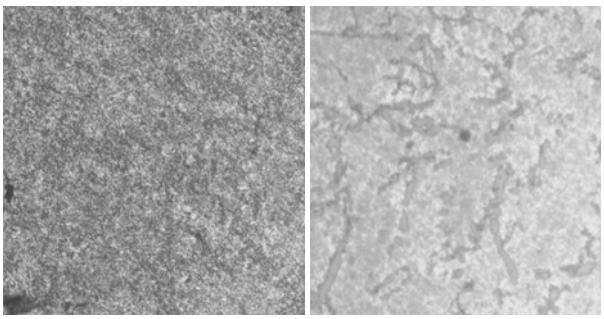


Figure 16: Hardness value for different wt% reinforcement

5.4 Microstructure



100X 500X

Figure 17: Microstructure of Al356+2%SiC+6%$ZrSiO_4$

It can be observed that there is a reasonably homogenous distribution of the reinforcement particles in the cast composite, due to which there is considerable increase in properties.

6. Conclusion

Aluminum based metal matrix composites are the most promising materials for the future automotive, aerospace and other applications. Al 356 alloy matrix hybrid composites reinforced with Zirconium Silicate and Silicon Carbide particles has been successfully synthesized by the stir casting method.

1. The results from the study reveal that there is considerable increase in the fracture toughness in the presence of both silicon carbide and zirconium silicate reinforcement in the matrix alloy. The matrix alloy with 2%SiC and 6%$ZrSiO_4$ reinforcement has shown high toughness for fracture.
2. The result shows the increasing hardness with the increase in the reinforcement weight fractions. The presence of hard reinforcement particles in the matrix could impede the movement of dislocations since these particles are stronger than the matrix in which they are embedded.
3. The ultimate tensile strength and the yield strength of the composite are more in presence of both the reinforcement than compared to the alloy in presence of single reinforcement. The increase in the strength can be attributed to homogeneity of the reinforcement particles in the matrix alloy.
4. Microstructure reveals a reasonably homogeneous distribution of SiC and $ZrSiO_4$ particles in the cast composite. It was found that the particles showed a strong tendency to accumulate in the colonies which froze in the last stage of solidification.

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