

## Synthesis and characterization of Al-SiO<sub>2</sub> composites.

### Abstract

In this paper, aluminum matrix composites are successfully synthesized by melting of Al scrap at 850 °C. The reinforcements were then added gradually for 10 minutes to the molten aluminum with different amounts weight ratios (10, and 20) wt.% of SiO<sub>2</sub>. Mixtures were stirred with 450 rpm for 10 minutes after the additions of SiO<sub>2</sub>. The mixture was poured into previously prepared sand mold. The uniaxial tensile, cupping, and biaxial tensile tests were conducted by Gant Universal test machine, and local designed biaxial tensile machine. Al-SiO<sub>2</sub> composites presented good resistance to both uniaxial and biaxial tensile tests. It was observed that the ultimate tensile strength for Al- SiO<sub>2</sub> composites with 0, 10, and 20 wt% of SiO<sub>2</sub> were 25 MPa, 62 MPa, and 65 MPa and respectively. The Al- 20 % wt of SiO<sub>2</sub> composite presents good resistance to biaxial tensile test, and both of composites present a lower deformation ratio. The cupping results were promising for the composite with a ratio of 10 % wt it was deformed without failure until the depth  $d = 1.8$  mm, whereas many cracks have been observed with 20 %wt of SiO<sub>2</sub> at small forming depth. Experimental and a finite-element simulation for biaxial and cupping test gave very closed results.

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