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## Effect of Alloying Elements and Growth Rates on Microstructure and Mechanical Properties in the Directionally Solidified Al–Si–X Alloys

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### Abstract

In this research, effect of alloying elements (X=Cu, Co, Ni, Sb and Bi) and growth rates on the microstructure and mechanical properties (microhardness and tensile strength) of the directionally solidified Al–Si eutectic alloy have been investigated. Al–12.6Si–2X (wt. %) samples were prepared using metals of 99.99% high purity in the vacuum atmosphere. These alloys were directionally solidified under constant temperature gradient and different growth rates (8.3–166.0  $\mu\text{m/s}$ ) by using a Bridgman–type growth apparatus. Interflake spacings, microhardness and tensile strength were expressed as functions of growth rate. The effects of alloying elements and growth rates on microstructure, microhardness and tensile strength were determined. According to experimental results, the microstructures, microhardness and tensile strength of the solidified Al–Si–X samples changes with alloying elements (Cu, Co, Ni, Sb and Bi) and the growth rates. The results obtained in this work have been compared with the similar experimental research in the literature.

**Keywords:** *Alloying elements; Al–Si alloys; flake spacings; directional solidification; microhardness; tensile strength*

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