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Tensile Properties of Aluminum Silicon Nickel Iron Vanadium High Entropy Alloys

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Abstract : Pure metals are not used in most cases for structural applications because of their limited properties. Presently, high entropy alloys (HEAs) are emerging by mixing comparative proportions of metals with the aim of maximizing the entropy leading to enhancement in structural and mechanical properties. Aluminum Silicon Nickel Iron Vanadium (AlSiNiFeV) alloy was developed using stir cast technique and analysed. Results obtained show that the alloy grade G0 contains 44 percentage by weight (wt%) Al, 32 wt% Si, 9 wt% Ni, 4 wt% Fe, 3 wt% V and 8 wt% for minor elements with tensile strength and elongation of 106 Nmm⁻² and 2.68%, respectively. X-ray diffraction confirmed intermetallic compounds having hexagonal closed packed (HCP), orthorhombic and cubic structures in cubic dendritic matrix. This affirmed transformation from the cubic structures of elemental constituents of the HEAs to the precipitated structures of the intermetallic compounds. A maximum tensile strength of 188 Nmm⁻² with 4% elongation was noticed at 10wt% of silica addition to the G0. An increase in tensile strength with an increment in silica content could be attributed to different phases and crystal geometries characterizing each HEA.

Keywords : HEAs, phases model, aluminium, silicon, tensile strength, model
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