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Letter to Editor Open Access

The Influence of Electromagnetic Frequency on the Microstructure

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Letter to Editor

For the first time, an $Al_{70}Zn_{10}Mg_{10}Cu_5Si_5$ medium entropy alloy was created by electromagnetic stirring casting in this study. The produced phases in as-cast alloys are mostly made up of the -Al solid solution, Mg_2Si phase, Al_2Cu phase, and $MgZn_2$ phase, and electromagnetic casting has little influence on them. The electromagnetic frequency, on the other hand, has a substantial impact on the content, distribution, and morphology of the second phase, particularly for the Mg_2Si phase, whose average particle size reduces from 40.0 to 17.7 m. Furthermore, compression mechanical characteristics were examined at room temperature, and it was discovered that adding a certain electromagnetic frequency significantly increased hardness, strength, and plasticity. In this study, the best electromagnetic frequency was 20Hz, with the appropriate Vickers hardness and ultimate compressive strength.

In the recent decade, high-entropy alloys (HEAs) and medium-entropy alloys (MEAs), which are made up of primary elements in equal or nearly equal atomic percentages (at.%), have gotten a lot of attention. Many of the alloys reported have a simple face-centered cubic (FCC), body-centered cubic (BCC), or hexagonal close-packed (HCP) microstructure, as well as excellent mechanical properties compared to traditional metal materials, such as high strength and toughness [1-5]. Excellent thermal stability, and excellent wear and corrosion resistance. As a result, these materials have a wide range of applications in the domains of high temperature (HT), wear resistance, and corrosion resistance. Initially, HEA/MEA research centred on transition metal elements such and CoCrFeMnNi systems. Senkov and colleagues published their findings in 2010High-entropy alloys (HEAs) and medium-entropy alloys (MEAs), which are composed of primary elements in almost equal atomic percentages (at.%), have received a lot of attention in the last decade . Many of the alloys described have a simple face-centered cubic (FCC), body-centered cubic (BCC), or hexagonal close-packed (HCP) microstructure, as well as superior mechanical properties to traditional metals, such as high strength and toughness excellent thermal stability, and excellent wear and corrosion resistance. As a result, these materials may be used in a variety of applications such as high temperature, wear resistance, and corrosion resistance. HEA/MEA research first focused on transition metal elements such AlCoCrCuFeNi and CoCrFeMnNi system. Senkov. For instance, it has a density of 2.67 g/cm^3, which is comparable to that of Al alloy, but it has an unusually high hardness of 5.9 GPA. It has a specific hardness of 2.21 GPA/ (g/cm^3). Used the empirical parameter technique to create an $Al15Li_{39}Mg_{45}Ca_{0.5}Si_{0.5}$ low-density HEA. It has a lower density (1.44 g/cm^3) than Mg alloy. High-entropy alloys (HEAs) and medium-entropy alloys (MEAs), which are composed of primary elements in almost equal atomic percentages (at.%), have received a lot of attention in the last decade The microstructure of several of the alloys mentioned is simple face-centered cubic (FCC), body-centered cubic (BCC), or hexagonal close-packed (HCP). The compressive strength is around 534 MPa, which is greater than Mg alloy, and the specific strength is approximately 370 kPa m^3 kg. Tun produced Al-based multicomponent alloys and using the fragmented melt deposition approach; their ultimate compressive strength and total compressive strain are 511 MPa, 533 MPa, and 6.3%, 6.0%, respectively. As a result, Al-based MEAs might be employed in rail transportation, autos, aircraft, and other areas requiring minimal weight.

Conclusion

The electromagnetic frequency has a significant impact on the composition, morphology, and distribution of the second phase, particularly for the Mg_2Si phase, which sees its average particle size drop from 40.0 to 17.7m following electromagnetic treatment. The Vickers hardness, ultimate compressive strength BC, and compressive yield strength sc are 177 HV, 554 MPa, and 500 MPa, respectively, at the ideal electromagnetic frequency of 20 Hz in this investigation.

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Conflict of Interest

The authors declare that they are no conflict of interest.

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