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Influence of Mechanical Properties and Microstructure of the Aluminium5083 with Nano Silicon Carbide Particles(50-60nm) Casted by Stir casting Using with and without Vibrations

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Abstract: *This study aims to investigate the influence of mechanical vibration of the mold on the mechanical properties of Al5083. Despite its importance, there is currently a lack of literature on this specific topic. To fill this gap, we will conduct a series of tests. Al-Si based alloys are the most important non-ferrous alloys. These alloys were enormously used in various sectors like marine, aerospace and automobile industries because of their excellent mechanical properties such as corrosion resistance, low density, low coefficient of thermal expansion, excellent wear and good strength. These are used in areas that require a combination of light weight and high wear resistant. But all these performances of these alloys depends on the grain refinement and particularly dendrite arm spacing of silicon particles. These applications demand the study of techniques to improve mechanical properties and grain structure by SEM analysis of these alloys. As a result, this review will provide the improvement in mechanical properties and grain structure alloy by applying mechanical mold vibrations during the casting process. After the casting process is done the alloy will be in molten state and then the alloy will be subjected to mechanical vibration during solidification. We will give different frequencies from 120-180 Hz for proper grain size, dendrite arm spacing also the inner defects will be reduced. Furthermore, test results indicates that mechanical and physical properties of aluminium alloys improves with the stir casting process.*
Aluminium 5083 is an aluminium-magnesium alloy with magnesium and traces of manganese and chromium. The chemical composition of 5083 aluminium alloy is as follows 1:Aluminium: balance Chromium: 0.05-0.25% max Copper: 0.1% max Iron: 0.4% max Magnesium: 4.0 to 4.9%Manganese: 0.4 to 1.0%Silicon: 0.4% max Titanium: 0.15% max Zinc: 0.25% max.

Keywords: Sem analysis, Mechanical properties

REFERENCES

[1]Kumar, V. M., & Venkatesh, C. V. (2019). A comprehensive review on material selection, processing, characterization and applications of aluminium metal matrix composites. Materials Research Express, 6(7), 072001.
[2]Kumar, R., Ansari, M. S., Mishra, S. S., & Kumar, A. (2014). Effect of mould vibration on microstructure and mechanical properties of casting during solidification. Int. J. Eng. Res, 3, 90-92.
[3]Sulaiman, S., & Zulkifli, Z. A. (2018). Effect of mould vibration on the mechanical properties of aluminium alloy castings. Advances in Materials and Processing Technologies, 4(2), 335-343.
[4]Ma, M., Lai, R., Qin, J., Wang, B., Liu, H., Yi, D., & Zhai, T. (2021). Achieving exceptionally tensile properties and damage tolerance of 5083 aluminum alloy by friction stir processing assisted by ultrasonic and liquid nitrogen field. Materials Science and Engineering: A, 806, 140824.
[5]Soleymani, S., Abdollah-Zadeh, A., &Alidokht, S. A. (2012). Microstructural and tribological properties of Al5083 based surface hybridcomposite produced by friction stir processing. Wear, 278, 41-47.

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[6]Zhu, J., Jiang, W., Li, G., Guan, F., Yu, Y., & Fan, Z. (2020). Microstructure and mechanical properties of SiCnp/Al5083 aluminum matrix composites prepared by squeeze casting combined with stir casting. Journal of Materials Processing Technology, 283, 116699.

[7].Singh, K., Singh, H., Vardhan, S., & Mohan, S. (2021). Mechanical study of Al 7050 and Al 7075 based metal matrix composites: a review. Materials Today: Proceedings, 43, 673-677.

[8].Meignanamoorthy, M., & Ravichandran, M. (2018). Synthesis, properties and microstructure of sintered and hot extruded boron carbide reinforced AA8079 (Al-Cu-Fe-Si-Zn) matrix composites. Materials Research Express, 5(11), 116508.

[9].Sajjadi, S. A., Ezatpour, H. R., &Parizi, M. T. (2012). Comparison of microstructure and mechanical properties of A356 aluminum alloy/Al2O3 composites fabricated by stir and compo-casting processes. Materials & Design, 34, 106-111.

[10].Abdudeen, A., Mourad, A. H. I., Qudeiri, J. A., &Ziout, A. (2020, February). Evaluation of Characteristics of A390-SiC p Squeeze Cast and Gravity Cast Composites. In 2020 Advances in Science and Engineering Technology International Conferences (ASET) (pp. 1-6). IEEE.

[11].Sharma, A. K., Bhandari, R., Aherwar, A., Rimašauskienė, R., &Pinca-Bretotean, C. (2020). A study of advancement in application opportunities of aluminum metal matrix composites. Materials Today: Proceedings, 26, 2419-2424.

[12].Pandey, U., Purohit, R., Agarwal, P., & Singh, S. K. (2018). Study of fabrication, testing and characterization of Al/TiC metal matrix composites through different processing techniques. Materials Today: Proceedings, 5(2), 4106-4117.

[13].Suresh, B. V., Shireesha, Y., Kishore, T. S., Dwivedi, G., Haghighi, A. T., & Patro, E. R. (2023). Natural energy materials and storage systems for solar dryers: State of the art. Solar Energy Materials and Solar Cells, 255, 112276.

[14].Bade, V. S., Srinivasa Rao, Y., Yegireddi, S., & Eshete, G. (2022). Influence of Nano Boric Acid Material in Bio-Diesel Blends to Enhance the Surface Quality with Minimum Quality Lubrication. Advances in Materials Science and Engineering, 2022.

[15].Bade, V. S. (2020). Experimental investigation on influence of electrode vibrations on hardness and microstructure of 1018 mild steel weldments. World Journal of Engineering, 17(4), 509-517.

[16].Suresh, B. V., Rao, P. S., & Rao, P. G. "Influence of Electrode Vibration on Impact Strength of 1018 Mild Steel Weldments", Test Engineering and Management, Vol. 83 No. 2, May 2020, pp. 14152- 14158.

[17].Bade, V. S. (2020). The effect of vibratory conditioning on tensile strength and microstructure of 1018 mild steel. World Journal of Engineering, 17(6), 837-844.

[18].Suresh, B. V., Rao, P. S., & Rao, P. G. Influence of Flexural Strength on Welded Joints under the Effect of Electrode Vibratory Welding Process. International Journal of Mechanical and Production Engineering Research and Development (IJMPERD), 10(3), 1345-1352.

[19].Shireesha, Y., Suresh, B. V., & Sateesh, B. (2018). Vibration Analysis and Control of Locomotive System. Mechanics & Mechanical Engineering, 22(1).

[20].Suresh, B. V., Rao, P. S., & Rao, P. G. (2019). Improvement of tensile strength of 1018 mild steel welded joints produced under the influence of electrode vibration. International Journal of Innovative Technology and Exploring Engineering (IJITEE), 8(8), 1219-1222.

[21].Suresh, B. V., Rao, P. S., & Damera, P. G. R. N. Vibratory Assisted Joining Processes for Quality Joints.

[22].Suresh, B. V., Rao, P. S., & Rao, P. G. INFLUENCE OF VIBRATIONS IN WELDING PROCESS TO ENHANCE MECHANICAL PROPERTIES: A REVIEW.

[23].Shireesha, Y., Suresh, B. V., Bahubalendruni, M. R., &Nandipati, G. (2019). Experimental investigation on mechanical properties ofbi-directional hybrid natural fibre composite (HNFC). Materials Today: Proceedings, 18, 165-174.

[24].Bade Venkatasuresh, Y. Shireesha and P. Srinivasa Rao. "Emission and performance analysis of an internal combustion engine with turbocharger using alternate fuel". JP Journal of Heat and Mass Transfer. Volume 17, Issue 2. PP- 539 - 551 2019.

[25].Suresh, B. V., Shireesha, Y., & Rao, P. G. Effect of Rear Axle Ratio on Vehicle Performance.

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[26].Musalaiah, G., Suresh, B. V., Rao, P. S., & Rao, P. G. (2017). Shear strength enhancement in vibratory lap welded joints. International Journal of Mechanical Engineering and Technology (IJMET), 8(1), 160-168.
[27].Suresh, B. V., Rao, P. G., Musalaiah, G., & Rao, P. S. (2017). Influence of vibratory weld conditioning on hardness of lap welded joints. International Journal of Mechanical Engineering and Technology (IJMET), 8(1), 169-177.
[28].MUSALAIAH, G., SURESH, B. V., PRASHANTH, B., & DHANRAJ, B. EXPERIMENTAL STUDIES ON TENSILE PROPERTIES OF JUTE FIBRE REINFORCED POLYMER COMPOSITES.
[29].Musalaiah, G., Suresh, B. V., Tanniru, M., & Reddy, P. R. (2017). Development and mechanical characterisation OF glass fibre reinforced. Polymer Composite, 8(7), 231-239.
[30].Venkata, S. B. FABRICATION OF COMBINED IN-PHASE AND COUNTER-PHASE STEERING MECHANISM OF A FOUR WHEEL DRIVE. International Journal of Engineering, Science and 6 (2017): 401, 415.
[31].Shireesha, Y., Suresh, B. V., & Rao, P. G. (2016). Emissions Reduction using Catalyst Converter. International Journal of ChemTech Research, 9(3), 540-549.
[32].Suresh, B. V., Shireesha, Y., & Sateesh, B. Evolution of performance of Primary and Secondary Air preheaters.
[33].Jagadeesh, V., Shireesha, Y., Babu, C. V., Suresh, B. V., & Sekhar, K. C. Optimization And Fabrication Of Dome Shaped Crop Dryer.
[34].Balamurali, M. G., Suresh, M. B. V., Shireesha, M. Y., &Sylaja, M. T. V. Fem Based Analysis Of Chip Tool Interactions To Study The Stress Distribution On The Rake Face. International Journal of Computational Engineering Research (IJCER).
[35].Babu, V. C., Suresh, B. V., & Rao, P. G. (2013). Determination of Mechanical Properties of Different Materials Using Inverse Finite Element Procedure for the Miniature Specimen Test Simulation. IOSR journal of Mechanical and Civil Engineering, 6(3), 25-36.
[36].Venkata Suresh, B., Shireesha, Y., & Srinivasa Rao, P. (2022). Influence of Mechanical Vibrations on Impact Strength of 1018 Mild Steel Butt-Weld-Joints. In Recent Trends in Product Design and Intelligent Manufacturing Systems: Select Proceedings of IPDIMS 2021 (pp. 633-644). Singapore: Springer Nature Singapore.
[37].Venkata Suresh, B., Shireesha, Y., & Srinivasa Rao, P. (2022). Influence of Mechanical Vibrations on Impact Strength of 1018 Mild Steel Butt-Weld-Joints. In Recent Trends in Product Design and Intelligent Manufacturing Systems: Select Proceedings of IPDIMS 2021 (pp. 633-644). Singapore: Springer Nature Singapore.
[38].Suresh, B. V., Shireesha, Y., & Rao, P. S. (2022). Effect of electrode vibration welding on impact and tensile strength of 1018 mild steel weld joints. In Recent Advances in Manufacturing Processes and Systems: Select Proceedings of RAM 2021 (pp. 347-359). Singapore: Springer Nature Singapore.
[39].Dumpala, R., Suresh, B. V., Ramasubramanian, K., Chittibabu, V., & Rao, M. R. Tribological and machining performance of the CVD diamond coatings against Alm-30SiCp MMC.
[40].Rao, M. V., Srinivasa, R. P., & Babu, B. S. (2020). Vibratory weld conditioning during gas tungsten arc welding of al 5052 alloy on the mechanical and micro-structural behavior. World Journal of Engineering, 17(6), 831-836. (ESCI, Scopus indexed)
[41].RAO, M. V., RAO, P. S., & RAO, P. G. Influence of Transverse Vibrations on The Fatigue Life of Aluminum Alloy Weld Connections. International Journal of Mechanical and Production Engineering Research and Development (IJMPERD) Vol. 10, Issue 3, Jun 2020, 1353–1358 { ISSN (P): 2249–6890; ISSN (E): 2249–8001 (Scopus indexed)
[42].M. Vykunta Rao, P Devi Prasad, Bade Venkata Suresh, "Influence of Mode of Power Source on the Mechanical Properties of Vibratory Weld Joints", International Journal of Innovative Technology and Exploring Engineering (IJITEE) ISSN: 2278-3075, Volume-9 Issue-2, pp. 2919-22, December 2019.
[43].M.Vykunta Rao, P. Srinivasa Rao and B. Surendra Babu, Effect of Transverse Vibrations on the Hardness of Aluminum 5052 H32 Alloy Weldments, International Journal of Mechanical Engineering and Technology, 10(01), 2019, pp. 327–333.
[44].M. VykuntaRao , Rao, P. S., & Babu, B. S. (2016). "Investigate the Influence of Mechanical Vibrations on the Hardness of Al5052 Weldments ", Indian Journal of Science and Technology, 9(39).

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[45].M. Vykunta Rao, P. Srinivasa Rao, B. Surendra Babu, and P. Govindarao (2017), "Effect of Vibratory Weld Conditioning on Residual Stresses and Weld Joint Properties: A Review", Journal of Manufacturing Technology Research, Volume 8, 1-2, pp.1-9.

[46].M. Vykunta Rao, P. Srinivasa Rao and B. Surendra Babu (2017, "Vibration Effect on the Impact Strength of Al5052-H32 weldments" , Journal Mechanical Engineering research and Developments, Vol. 40, No. 1, 2017, pp. 311-316.