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Design and Analysis of Aluminium Lead Oxide Alloy Using Stir Casting Process

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ABSTRACT

Present day material is one of the major factors will affect the productivity and cost. In order to reduce the material cost day by day the invention of new material necessary for sustainable development for nation. This project deals with processing and development of Aluminium Lead oxide ($AlPb_3O_4$) by using Stir casting process instead of Aluminium alloy. Since the aluminium alloy have low weight and low strength. The $AlPb_3O_4$ have low weight and high strength. The lead oxide proportion is key factor to improve strength and reliability. To develop an alloy of Aluminium and Lead Oxide by using Stir casting process and to test the developed alloy material physically using various destructive testing methods and to compare the result obtained through physical testing with the result obtained from analysis software. In this project we made an alloy of Aluminium and Lead Oxide as a simple bar. The alloy bar made is then subjected to physical test which is destructive. We made two set of separate alloys with two different compositions one with Lead Oxide– 8% and Aluminium – 92%. And the other with Lead Oxide – 5% and Aluminium – 95%. These both alloys are subjected to various tests such as tension tests, bend tests and Charpy impact tests.

INTRODUCTION

This project deals with processing and development of Aluminium Lead oxide ($AlPb_3O_4$) by using Stir casting process instead of Aluminium alloy. Since the aluminium alloy have low weight and low strength. The $AlPb_3O_4$ have low weight and high strength. The lead oxide proportion is key factor to improve strength and reliability. Aluminium is derived from the mineral bauxite. Bauxite is converted to aluminium oxide (alumina) via the Bayer Process. The alumina is then converted to aluminium metal using electrolytic cells and the Hall-Heroult Process.Worldwide demand for aluminium is around 29 million tons per year. About 22 million tons is new aluminium and 7 million tons is recycled aluminium scrap. The use of recycled aluminium is economically and environmentally compelling. It takes 14,000 kWh to produce 1 tonne of new aluminium. Conversely it takes only 5% of this to remelt and recycle one tonne of aluminium. There is no difference in quality between virgin and recycled aluminium alloys.Pure aluminium is soft, ductile, corrosion resistant and has a high electrical conductivity. It is widely used for foil and conductor cables, but alloying with other elements is necessary to provide the higher strengths needed for other applications. Aluminium is one of the lightest engineering metals, having a strength to weight ratio superior to steel.

LITERATURE REVIEW

(1) Material Properties Data: Alumina (Aluminum Oxide) Archived 2010-04-01 at the Wayback Machine. Makeitfrom.com. Retrieved on 2013-04-17.From

this reference we have taken the Alumina is an oxide-based engineering ceramic. It can have a fairly high thermal conductivity and a moderately high heat capacity among oxide-based engineering ceramics.

(2) "Alumina (Aluminium Oxide) – The Different Types of Commercially Available Grades".The A to Z of Materials. 3 May 2002. Archived from the original on 10 October 2007. Retrieved 27 October 2007.From this reference we have taken the Alumina (Aluminium Oxide) is the most widely used oxide ceramic material. Its applications are widespread, and include spark plugs, tap washers, abrasion resistant tiles, and cutting tools.

(3) American Elements, Aluminum Oxide, American Elements, USA, n.d., Accessed on: Oct. 28, 2019. From this reference we have taken the **Alumina**, commonly known as **aluminium oxide (Al_2O_3)**, is an inert, odourless, white amorphous material often used in industrial ceramics. Due to its outstanding properties, alumina has contributed to a significant number of life-extending and society-enhancing applications. It is widely used in the medical field and modern warfare.

DESIGN METHODOLOGY

- In this project we made an alloy of Aluminium and Lead Oxide as a simple bar.
- The alloy bar made is then subjected to physical test which is destructive.
- We made two set of separate alloys with two different compositions one with Lead Oxide – 8% and Aluminium – 92%.
- And the other with Lead Oxide – 5% and Aluminium – 95%.

Figure 1: Aluminium lead oxide workpiece

Figure 2: Image for fabrication process

Figure 3: Picture during heating process

MERITS AND ITS APPLICATIONS OF THIS PROJECT

ADVANTAGES

- It can be melted cast, formed and machined in a similar way to these metals and conducts electric currents.
- This composition is high electrical conductivity and thermal efficiency.
- It is a best heat conductor.
- Cheap and best.
- Light weight and corrosion resistance.
- High Ductility and Meallablity.

APPLICATIONS:

- It is prefer for PH sensors.

- Manufacturing of electric pin materials.
- It is used in aerospace industries for making wings and other parts.
- It is used in ship building.

CONCLUSION

Aluminium alloys have a wide range of applications due to their excellent combination of lightweight, high strength, corrosion resistance, and good formability. Lead oxide aluminum alloy, also known as leaded aluminum or AlPb alloy, is a type of alloy that contains both aluminum and lead oxide as its main constituents. This alloy possesses certain characteristics that make it useful for specific applications. The composition of 5% lead oxide and 95 % aluminium is the safe alloy in which we can use it for applications instead of other aluminium alloy materials. The result is obtained by comparing the theoretical values and the results obtained from the ansys software. We can use 5% lead oxide 95% aluminium alloy material for the applications where we use normal aluminium alloy materials.

REFERENCES

1. Material Properties Data: Alumina (Aluminum Oxide) Archived 2010-04-01 atthe Wayback Machine. Makeitfrom.com. Retrieved on 2013-04-17.
2. "Alumina (Aluminium Oxide) – The Different Types of Commercially Available Grades".The A to Z of Materials. 3 May 2002. Archived from the original on 10 October 2007. Retrieved 27 October 2007.
3. CeramTec, The Most Well-known Oxide Ceramic Material, CeramTec, Germany, n.d., Accessed on: Oct. 28, 2019.
4. American Elements, Aluminum Oxide, American Elements, USA, n.d., Accessed on: Oct. 28, 2019.
5. Guichon Valves, Alumina - Manufacturing process of Alumina, Guichon Valves, France, n.d., Accessed on: Oct. 28, 2019.
6. Kozaka M, Fuse N, Ohki Y, Okamoto, T Tanaka, T. IEEE Trans Dielectr Electric Insul 2005, 11, 833.