Global Scientific JOURNALS

GSJ: Volume 8, Issue 3, March 2020, Online: ISSN 2320-9186
www.globalscientificjournal.com

COMPARATIVE MICRO-STRUCTURAL STUDY OF LOCALLY PRODUCED ALUMINUM ALLOY MOTORCYCLE BRAKE HANDLE USING CLAY AND CEMENT BONDED SAND WITH IMPORTED (CAST) BRAKE HANDLE

UKACHI P.A., ADEWUYI R.A. AND EMMANUEL A. A.

DEPARTMENT OF MECHANICAL ENGINEERING
FEDERAL POLYTECHNIC, ADO-EKITI

+2348035803096
patrickukachi@gmail.com

ABSTRACT

In foundry practice and engineering, there is a common believe and understanding that sand is one of the best moulding materials. There are different types of moulding sand with different binders which has also brought about different casting processes and names. In this work, cement and bentonite clay is used independently in moulding and casting of motorcycle brake handle. Micro structural examination was comparatively carried out on the locally and imported casts alloys with a view to see the behavioral structural arrangements compared

with the standard (imported) one using metallurgical digital microscope. The structure showed that the grain structure for the imported consist of nodules of graphic (dark balls) and retained austenite (white constituents) in austferrite with fines grain structure making it harder. The structure of the cement bounded casting is showing thicker concentrations of the grains than the clay bounded moulding sand casting.

Keywords: Microstructure, casting, Foundry Sand, Cement clay.

1.0 INTRODUCTION

Foundry is the field of engineering and practice which deals with the production of castings by the processes of mould preparation, metal melting and pouring of the molten metal into the moulds, in order to get the shape made by the patterns on solidification of the molten metal. (Ukachi P.A., 2002).

Foundry is the mother of all industries. The eventual achievement of industrial emancipation and economic self-reliance in Nigeria hinges on the success of our foundry industries (Ezekwe, 1995).

Castings as products of foundries, imparts every facet of the economy. They are found in various sectors covering the basic needs of man, such as clothing (textile), shelter (housing), food (food and beverages), water transportation, construction, mining, health and other sector of the economy including defense and military

(Adeosun, 2008). The foundry industry in nigeria is much older than the history of iron melting and casting itself and can be traced back to Nokculture of 2,000 years ago in the middle-belt area of the country (Olorunfemi, 1995). In the foundry chronicle of March, 1994 it was also revealed that bronze casting was practiced by the Binis for over 1000 years, in the south-west plan. It is also a well-known historical fact that Ife has its decorative brass works (Olorunfemi 1995).

Presently, the foundry industry in Nigeria, despite its early start is still at its infancy. The importance of the foundry industry to the economy cannot be overemphasized. UNDP/UNDO and the federal government of Nigeria reported, in the foundry chronicle of March, 1994 that the current installed stalled capacity of foundries can only satisfy only 30% of the market in Nigeria and even so only 55% percent of installed capacity is utilized (Ukachi, 2018) Nigeria, an aspiring great nation did not follow up the early start of the Binis technologies, and skills to transform its technology and economy. The result is that all components that ought to have been produced locally are imported (Anosike, 1995) Nigeria is rated as a consumer nation rather than a productive nation resulting to importing every little consumer goods ranging from tooth picks to machines, the failure to produce has resulted to bad economy, unemployment, and mass exodus of the youths to foreign lands for greener pasture (Ukachi P.A., 2018). Despite the competition from plastic and ceramics, metals still remain the dominant materials in the

production of capital equipment and manufactured goods. Metal casting will continue to play a major role, as a manufacturing process of considerable versatility, for the foreseeable future (Clegg, 1991).

2.0 MATERIALS AND METHODS

(A)MATERIALS

Aluminum alloy scraps was purchased from a local scrap market in Ado-Ekiti. Foundry sand was collected in the nearby sand deposit. Melting furnace, moulding tools copes and drags. Digital camera and grinding machine.

(B) Methods: Thefoundry, sand is sieved to make the grains smaller and uniform as shown in plate 1. It is divided into two portions,Bentonite and water is mixed with the first portion of the sand in suitable proportion, the mould of the brake handle and specimen mould are prepared and kept ready.

The second portions of the moulding sand is also mixed with cement as binder. The moulds and specimen is prepared after mixing with the suitable proportion of water and cement. Bentonite clay moulds are dried in the oven while the cement is allowed to harden and set with allowing them with natural air.

When they have dried for at least 2 days, the moulds are set and ready to be covered as shown in plate 2

The aluminum alloy scraps are melted in the furnace as shown in plate 3.

After the molten metal is made ready, it is poured into the mould as show in plate 4. The castings are extracted as shown in plate 5. The micro-structural specimens are cut as shown in plate 6.

3.0 METHOD- MICRO-STRUCTURAL ANALYSIS

The specimen was cut into the require dimension of 10mm x 10mm. they were grinded polished with the aid of grinding machine and the use of emery cloth of different grades. They were later polished. Anita was prepared with composition of 50% Hcl (Hydrochloric Acid) and 50% water, then cotton wool was dipped in the Anent and placed on the sample surface for 3 minutes and they are allowed to dry by using hand dryer and then captured with digital microscope at the magnification of x 100 and x 200 as shown.

Fig I, Fig 2 and Fig 3.

4.0 RESULT AND DISCUSSION

4.IDISCUSSION

The micro-structure of the locally and imported aluminum alloy brake motorcycle handles are presented in the fig 1 to 3. Microstructural examination was comparatively carried out on the locally and imported cast alloys with a view to

see the behavioral structural arrangements compared to the standard(imported) one using metallurgical digital microscope.

The structure showed that the grains structure for the imported consists of nodles of graphite (dark balls) and retained (white constituents) in austferrite with fine grain structure, making it harder. The structure of the cement bonded casting is showing thicker concentrations of the grains than the clay bonded moulding sand. It is worthy of note that the cast alloys interacts with the sandmould which is rich in silica and iron content, thereby bringing about the material hardness (Bam et al, 2016).

5.0 CONCLUSION

It can be concluded from the foregoing that:

(i) Locally produced cast aluminum alloy brake handle has micro-structure appearance that are acceptable in casting.

(ii) Cement and Bentonite clay which are locally available are good bonding material in foundry practice.

(iii) These foundry materials are available in the country.

6.0 RECOMMENATION

The Federal Government should create enabling environment for foundry to strive. Foundry castings should be tested for quality.

Establishment of small scale foundry shops throughout the states and local government will be a step in the right direction.

The exportation of metal scraps should be banned.

FAN and NMS should prepare and push for a policy frame work to reposition the foundry industry so that the country could maximally reap the benefits.

REFRENCES

Adeosun S.O. and Osoba, 2008 foundry industry. As a tool for technological Advancement in Nigeria. Proceedings of the 25th NMS Conference, 2008

Anosike, C.O. 1995, Foundry Chronicle, A newsletter published by the council of t

Bam S.A. et al, 2016): Comparative Micro-structural study of locally produced aluminum alloy motorcycle clutch handle using sand and die casting with imported (cast) handle. International journal of Trend in Research and Development, Volume 3(2), ISSN: 2394-9333.www.ijtrd.com.

Clegg A.J (1999), Precession Casting Processes, Pergamon Press, Oxford New York Beinging, Frank Fort-Soul, Toky.

he foundry Association of Nigeria (FAN, 1995).

Ezekwe G.O. 1995: Foundry Chronicle, A Newsletter Published by the Council of Foundry Association of Nigeria (FAN).

Ukachi P.A. 2002,: Essentials of Foundry Technology and Practice Book one Published by Greenline Publishers, 2 Odo-Ijigbo street, Ado-Ekiti, Nigeria.

Ukachi P.A. 2018, Evaluation of soundness of Aluminum alloy motorcycle clutch handle produced by sand, die Casting Process and imported casting. Journal of Engineering and Earth Sciences Volume II No 1 April 2018. ISSN: 1897-8680. Journal of Engineering, Federal Polytechnic, Ado-Ekiti.

Ukachi P.A. and S.O. Ejiko 2018, Importance of Vocational Technical Education in the present day Nigeria Economy. www.globalscientific.journal.com

Appendix

Plate 1. Sand been sieved

plate 2. Moulds set be cast

Plate 3 .Aluminum alloy scraps melted in the Furnace.

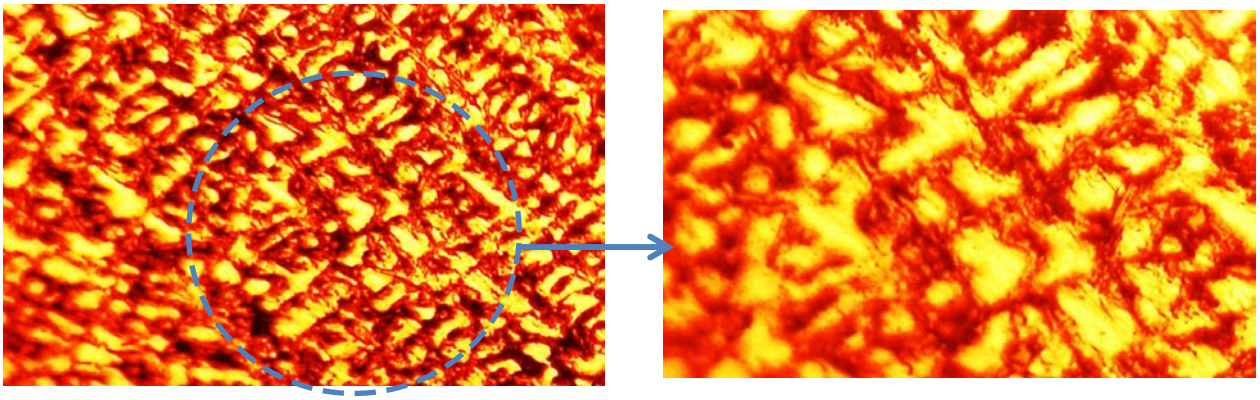
plate 4.Molten metal been poured into moulds.

Plate 5.Castings extracted from the moulds

Plate 6. Microstructural specimen.

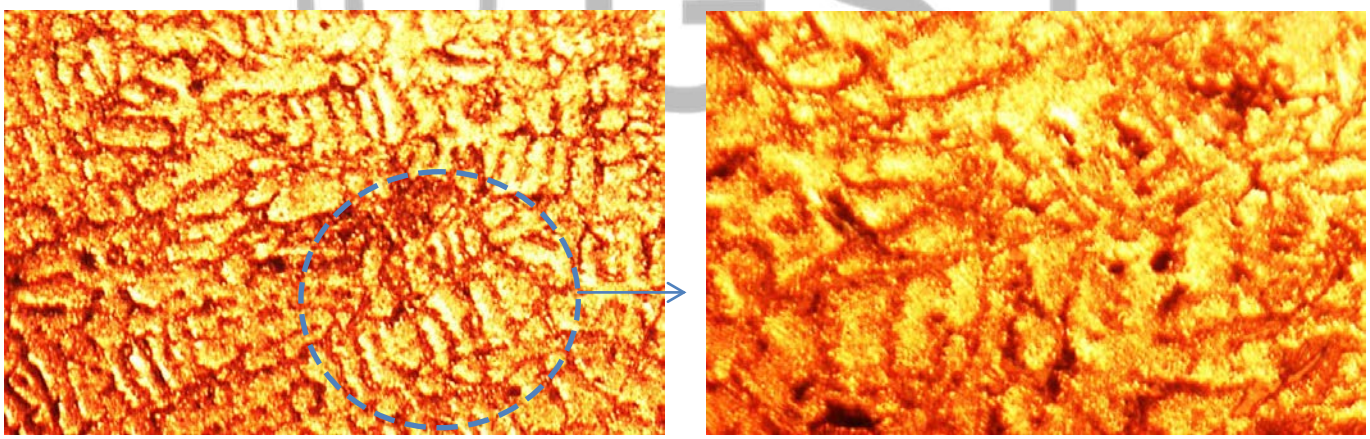
4.2 Result of Microstructure Test

The result of Microstructure of motorcycle brake handle for cement bonded mould and for dry sand is shown in Figure 4.1 and Figure 4.2 respectively.



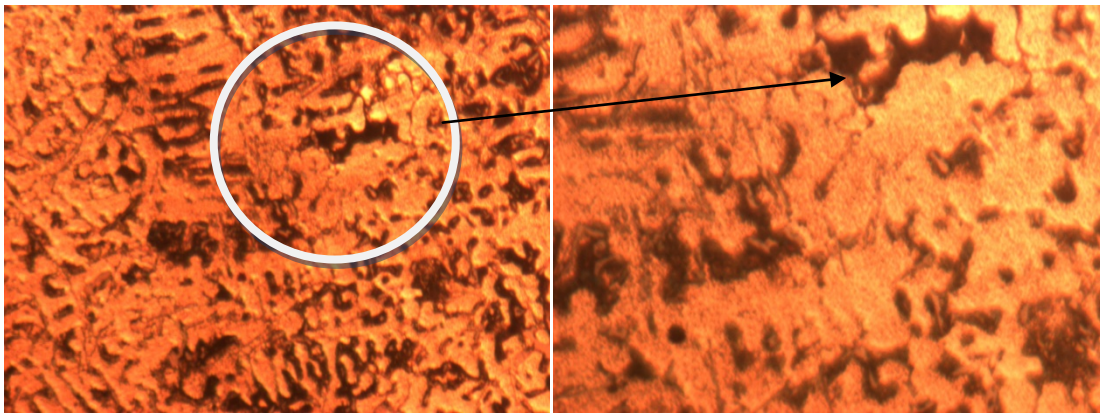
X100 X 200

Figure 4.1: Microstructure of sample for cement bonded mould



X100 X 200

Figure 4.2: Microstructure of sample for Dry sand mould



X100 x200

Figure 4.3: Microstructure of sample for imported one