DEVELOPMENT OF CAST ALUMINIUM ALLOYS FOR ELEVATED TEMPERATURE APPLICATIONS

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ORIGIN OF PROJECT

- Most of the Al-Si cast alloys today are intended for applications at temperatures of no higher than about 232°C
- Above this temperature, the alloy's microstructure strengthening mechanisms will become unstable, rapidly coarsen and dissolve resulting in an alloy having an undesirable microstructure for high temperature applications
- Such an alloy has little practical application at elevated temperatures because the alloy lacks the coherency between the aluminium solid solution lattice and the precipitated strengthening particles

OBJECTIVE PROJECT :

- To develop casting aluminium alloys work at higher temperature.
- Study the evolution of microstructure of each casting.
- Study hardness of Brinell and Vicker for each casting.

EXPERIMENTAL METHODS :

In this study we use an A2017 to develop the casting of aluminum alloys, table below shows the main composition of A2017. The A2017 is further smelting into 9th designated casting with an additional of Chromium and Zirconium

Al	Cr	Cu	Zn	Fe	Ti	Mg
93.34	0.018	4.277	0.029	0.286	0.017	0.725

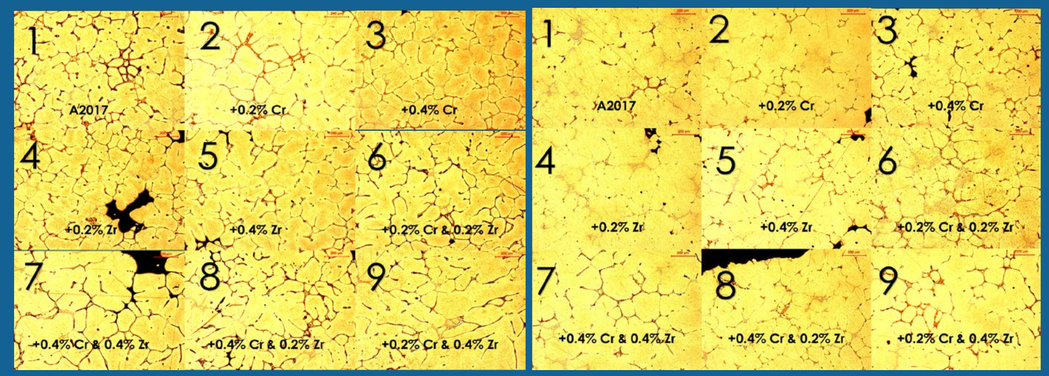
Casting	Material
1	A2017
2	A2017 + 0,2 % Cr
3	A2017 + 0,4 % Cr
4	A2017 + 0,2 % Zr
5	A2017 + 0,4 % Zr
6	A2017 + 0,2 %Zr + 0,2 Cr
7	A2017 + 0,4 % Zr + 0,4 Cr
8	A2017 + 0,2 %Zr + 0,4 Cr
9	A2017 + 0,4 % Zr + 0,2 Cr

EXPERIMENTAL PROCEDURE

RESULTS :

1.Metallographic Study

- To see the changes in microstructure of each casting
- To study the effect of adding Cr and Zr into the casting
- To study the size of α-phase of casting



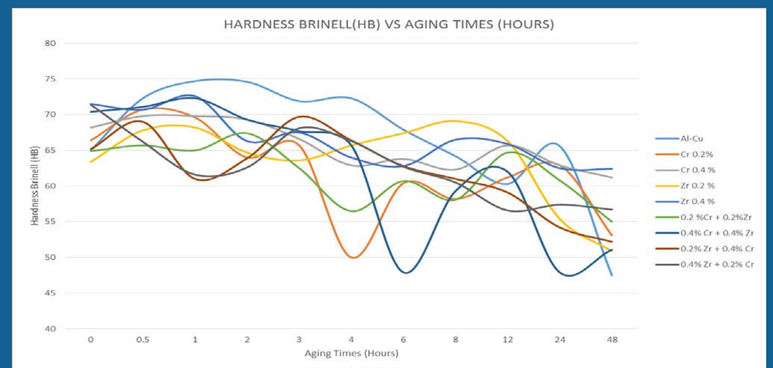
After smelting

After Heat Treatment

2.Hardness Study

Hardness Brinell

- The hardness brinell took place after the process of aging
- The aging process take place from 0 hours until 48 hours
- To determine the evolution of hardness for each casting after the aging process
- To study the influence of additional of Zr and Cr in the hardenss properties of each casting

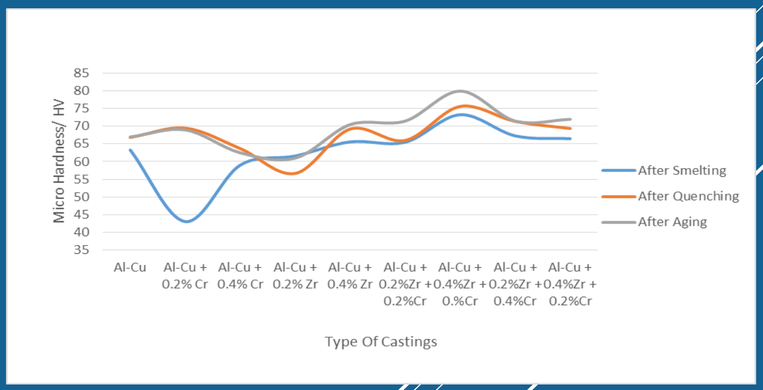


Hardness Vickers

- Tested out in three different situation

1. After Smelting
2. After Quenching
3. For the highest value of hardness Brinell of each casting

- To determine of the hardness of a-phase for each designated casting
- Effect of additional Cr and Zr in the change of a grain for the each microstructure.



CONCLUSIONS :

- The experimental results do not show a significant influence of Cr or Zr grain size, and only small differences have been observed
- The effect of addition Cr and Zr into the casting slightly brought down the hardness value attributed by an incomplete dissolution and homogeneous distribution of addition elements
- As for the microstructure of the casting produced, there are parts of a-phase growing quite bigger
- The effect of adding Cr into the casting can be seen as the clumps of compounds transform into a polyhedral, star-like structure