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Treatment of industrial waste in Diyala Company

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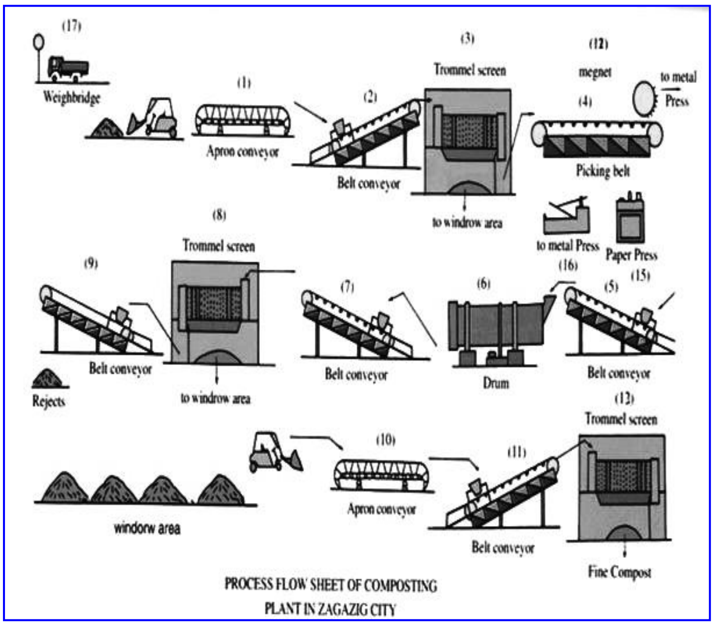
Abstract: It had been evaluating the possibility of using solid metal waste to a subsidiary of the Ministry of Industry and Minerals companies, noting that the results of the tests of models for improving the fine structure and the results are encouraging when taking the environmental impact of the disposal of solid waste in the search account the results of the evaluation, and add some elements that lead to change in microsurgery and be enough to get the amendment process effectively. The results also show that the thermal homogenization process led to the needle structure change or fibrous form a spherical shape clearly. Sizing of the environmental impact of the launch of the solid waste about the possibility of using other waste once or extraction of useful materials, including a solution to the problem of the process facing the industrial companies of various productive sectors, which are solid metal waste in most cases as a result of accidental activities for.

Keywords: Recycle , Modification, Industrial Waste, Heat homogenizing .

Introduction:

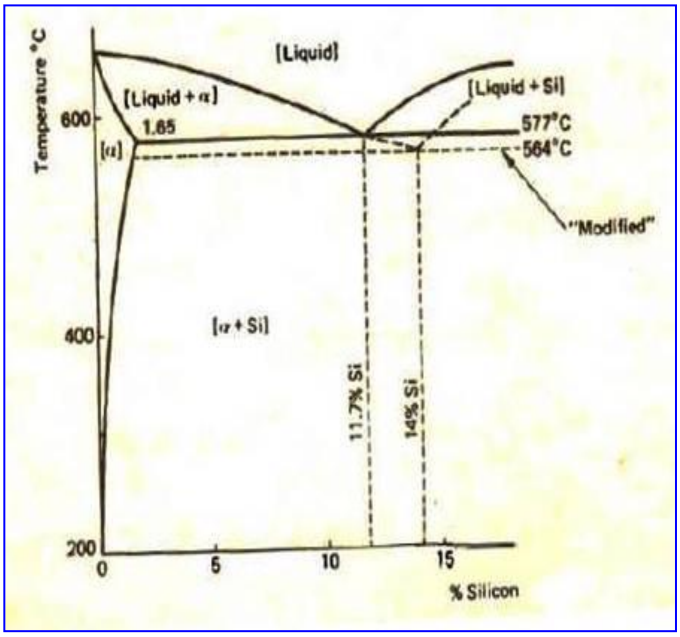
In many situations, like those in Iraq have gone through, when shortage of fresh Al happens, remelting of scrapped castings becomes unavoidable to obtain new castings. However, non-homogenous microstructure and low mechanical properties are characteristic of these castings obtained by remelting, especially when the scrapped materials are made from modified alloys [1,2].The eutectic morphology ranges from plate-like to lamellar like in as cast condition to a circular like after modification or rapid cooling [3]. When Al-Si alloys are solidified the eutectic silicon is seen to consist of coarse plates in the sharp edges. These are detrimental to the mechanical properties [4]. However, soon afterwards the effect of modification was found. Al-Si casting alloys are particularly of great importance as they offer good casting properties, good corrosion resistance, in addition to improved wear resistance [4,5]. However, the morphology of Si eutectic in these alloys is of great significance on controlling their properties, as it is usually grows in lamellar or fibrous or spheroidized form [6]. Homogenization treatments, originally designed for Al-Si cast alloys, also has an effect on the Si particles morphology, as it changes their shape from lamellar to spheroid [7,8]. The addition of elements like Na, Sr, Sb, and Ti was found to induce an effect on the microstructure of the eutectic alloy depending on their addition procedure and amount. Both modes of refinement of (Ti) and modification of Na, Sr, Sb have an effect on microstructure, but in a rather different way, as the first control the nucleation rate rather than the morphology of the second phase [8,9]. Al-Si casting alloys are known for their good casting properties and a great number of researches have been conducted on their refining and/or modification to optimize its mechanical properties [10,11]. Aluminum casting alloys are gaining wide popularity, as they combine several attractive properties such as low density, high stiffness, good casting characteristics, as well as improved properties if the alloy microstructure is refined or modified. The effect of modification has been attributed to both affecting nucleation and Si morphology through prohibiting its growth [12] . While modification alters the shape of the Si phase. Some other external factors like vibration or rapid solidification cause an alternation in the morphology of the Si eutectic [9, 13].



Experimental Procedure:

The experimental program of this work consisted of producing a number of castings (6) by remitting scrapped castings made of Al-12%Si alloy in a gas furnace. The melt was refined by adding Ti in the range (0.3-0.35)% Ti. The melt composition was controlled by adding fresh Al. the Ti was added in an elemental form, weighted and wrapped with Al foil. The Ti-wrapped in foil was laid in the bottom of an alumina crucible and the molten metal was poured over it. The whole melt was held afterwards for 15 min in the gas furnace for melt homogenization. The molten metal was poured at 580 °C in a preheated steel mold. The cast pieces were homogenized at 450 °C for different durations 5, 10, 15 ,20, 25, hrs.

	Si	Fe	Cu	Mn	Mg	Zn	Ti	Cr	Ni	Pb	Sn	AL
AL-12%Si	**12.00**	**0.25**	**0.018**	**0.176**	**0.004**	**0.031**	**0.02**	**0.015**	**0.005**	**0.01**	**0.003**	**Rem.**
AL-12%Si-0.3%Ti	**12.00**	**0.25**	**0.018**	**0.176**	**0.004**	**0.031**	**0.3**	**0.015**	**0.005**	**0.01**	**0.003**	**Rem.**
AL-12%Si-0.35%Ti	**12.00**	**0.25**	**0.018**	**0.176**	**0.004**	**0.031**	**0.35**	**0.015**	**0.005**	**0.01**	**0.003**	**Rem.**



Thermal Equilibrium Diagram

Figure Shown The Industrial solid waste used in the search

Figure Shown Stages of production plumbing injection.

Result and Discussions

The depicted changes in microstructure reveals that the Si-eutectic changes its morphology by heating at (450)°C through five stages; nucleation, fragmentation, spherodization, growth, and finally stabilization. The first stage after (5) hrs. is a stage where growth of the Si starts by diffusion of Si from the matrix to the particles. After (10) hrs. the Si starts to diffuse out of the Si-eutectic particles and fragmentation of these particles happens changing their morphology. After that the Si particles becomes spheroidized for both alloys without Ti and with (0.35)%Ti, whereas, only partial spherodization happens in the alloy containing (0.3)%Ti. The sherardized particles start to grow, growth of the Si particles proceed with holding time till these grown particles reach a stable state of their size and changes only happen to their shape. The microstructure as of the Al-12%Si cast alloys without Ti and with (0.3)%Ti & 0.35%Ti, respectively, is seen to consist of two phases mainly, which are primary □- Al and eutectic Si. Adding the (0.3)%Ti is seeing to modify the Si-eutectic morphology slightly but has no effect on refining the primary□. While, (0.35)%Ti modifies the Si-eutectic morphology greatly and changes the primary □ to have a fine dendritic structure. This effect is believed to be due to the role of Ti in reducing the melting point of the alloy, thus giving a higher chance for nucleation of the primary□ Al relative to the Si-eutectic, this is in turn refines the primary (□) phase and inhibits the Si growth. The microstructure of the studied alloys after homogenization at 450 °C for (5, 10, 15, 20, 25) hrs. respectively. It is a worth mentioning that recent references [7, 8] have pointed out that the addition of Titanium in various forms to aluminum Alloys have a strong effect on nucleating the primary aluminum phase. These studies have shown that Ti in solution in the liquid metal even below the (0.3)% , determined by equilibrium data from the phase diagram, and as low as (0.3)% would be expected to precipitate (TiAl3), which is an active nucleus for aluminum. The different surging times of heat treatment aims to detecting the changes that happens with the microstructure refinancing . It is worth noticing that the time necessary for stabilization changes from alloy to alloy, as stabilization happens after (25) hrs for the alloy without Ti & with (0.35)%Ti, while it happens after 100 hrs for the alloy containing (0.3)%Ti. This stable size of the Si-particles ranges from (5-10) □m. The measured hardness of all the studied alloys in as cast and homogenized conditions .The data shows that adding Ti to Al-Si eutectic cast alloys increase their hardness in as cast condition. This effect might be explained by an increase in the eutectic content or the formation of (TiSi) particles [11], which is not investigated in this study. Homogenization, of these alloys cause a significant drop in hardness of all alloys and this drop continues with homogenization time. The possible causes behind this drop in hardness are stress-relief and change in Si-eutectic morphology. However, these studies have recorded that (TiAl3) was present on (TiB2) crystals at the lower levels of Ti than that expected from the phase diagram (0.35%Ti) [8]. Some of these studies reported a poisoning effect of Si on the grain refinement action of Ti when Si% is high due to the possibility of formation of TiSi [9].

Conclusions

1. Adding elemental Ti (0.3)% to Al-12%Si alloy causes partial modification of the Si eutectic, and as (Ti) content reaches (0.35)% maximum modification is gained.
2. Homogenization treatment of Al-12%Si cast alloys with or without Ti causes a modification in the Si eutectic morphology through 6 stages.
3. When Ti content reaches (0.3)% the mechanisms for modification of Si eutectic through homogenization becomes similar to those of the alloy without Ti.
4. Adding Ti to Al-12%Si cast alloys causes an increase in their hardness.
5. The stabilization state is reached after (25) hrs. for the alloy with (0.35)%Ti, while it is reached after (15) hrs. for the alloys without or with (0.3)% Ti

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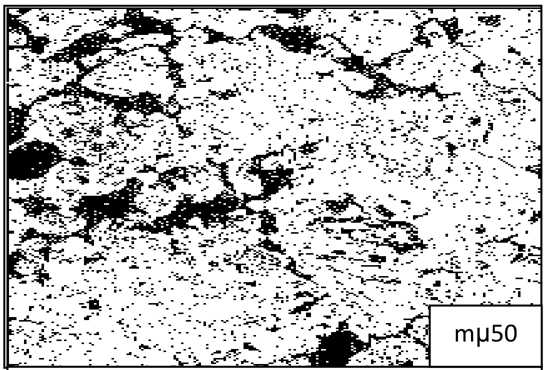

Fig.(1)Microstructure of As Cast and Modified Alloys

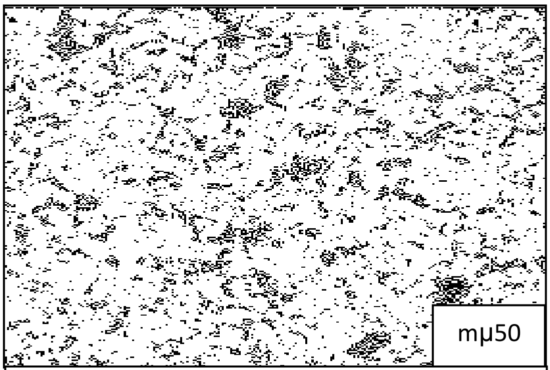

Fig.(2)Microstructure of Homogenized Alloys with(5)hrs. At 450 C^0

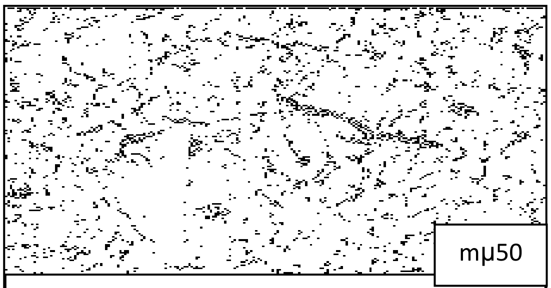

Fig.(3)Microstructure of Homogenized Alloys with (10)hrs. At 450 C^0

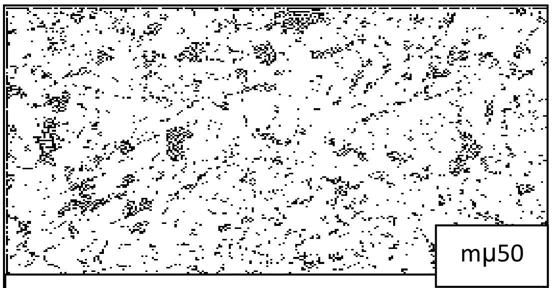

Fig.(4)Microstructure of Homogenized Alloys with (15)hrs. At 450 C^0

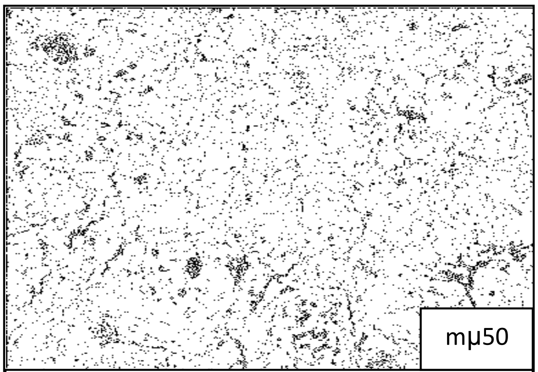

Fig.(5)Microstructure of Homogenized Alloys with (20)hrs. At 450 C^0

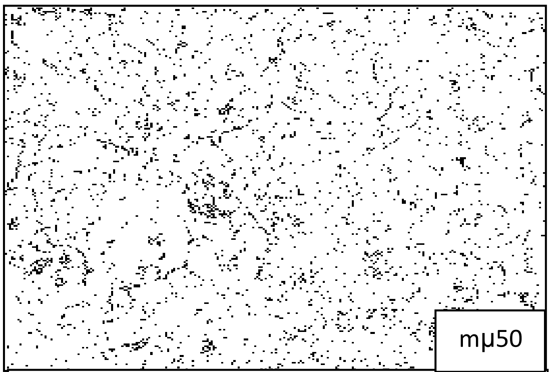

Fig.(6)Microstructure of Homogenized Alloys with (25)hrs. At 450 C^0