

(Al-12Si) leads to an increase in the solubility of silicon in the solid solution, as well as proven experiments

Increasing the percentage of silicon leads to a decrease in the coefficient of thermal expansion.

2- Study the wear and tear behavior:

Now a days, aluminium-based metal matrix composites (Al MMCs) are used in making of piston, connecting rod, contactors, where sliding is an important factor [26]. Excessive wear of the mating components sometimes leads to catastrophic failures [27]. So study of wear properties of Al MMCs has become the need of time. Wear tests are generally conducted on ball/pin wear tester, schematic diagram as represented in Figure 3. Wear properties of many MMCs having continuous and discontinuous reinforcements like Al_2O_3 , MnO_2 , SiC, graphite, mica, glass, graphite and others have been reported [28, 29, 30]. (Rashed and his group, 1993): Prepare a metallic base material and use the Al-20% Si alloy and added to it a ceramic material for the reinforcement is (Si₃N₄, 30% SiC, α -Al₂O₃ (WC, sizes) Different granularity. Prepare the ingot in a powder technology with a hot pressure and one-way (500Mpa, between improved hardness and mechanical properties such as wear and tear resistance) tests on the reinforced alloy and the best results obtained are high hardness and wear resistance Excellent for reinforced alloy with (30% SiC) and granular size ranging between μm (100-250) compared to the base material.

(Kady and his group, 2003): Show the effect of wear behavior of an alloy (Al-16.47Si-4.29Cu) prepared

By pressing plumbing method and again by spiral plumbing at high temperatures. One of the results was that the largest wear resistance occurs in the plumbing samples Squeeze casting while whirlpool plumbing increases the agglomeration on the crystalline boundaries and thus reduces the placement susceptibility. It was found that the increase in the ratio of reinforcing materials increases wear resistance, because the increase in the SiC ratio leads to an increase in the hardened minutes that bear the load, and thus This researcher has found that the wear and tear at high temperatures ($^{\circ}\text{C} 250, 200, 150$) is affected by the ratio of added stiffness and its applications include manufacturing motor vehicles and mechanical equipment.

(SaadHameed and his group, 2007): They were interested in studying the effect of adding graphite on the wear resistance of an alloy Aluminum-silicon, as the base ingot was prepared by a plumbing method by mixing and adding graphite to it (5.5%) using the vortex Technique Stirring technique, and then the samples were prepared to test the sliding wear and tear, and it was found that the wear rate increases in the case of an increased load and a distance Slip and surface roughness, as well as between the researcher, the wear resistance of the composite material is higher than that of the base material.

(Muhammad Saeed and SudairMwaffaq 2009): They were able to prepare a composite material based on aluminum 99.9% purity with SiC (α) booster in powder metallurgy method. Has been added The stiffening material is in different proportions (7.5% -10% -15%) and has a particle size of (μ 125) and the end The main is to study the properties of a compound (wear and tear rate) by examining Brinell hardness It has been found that the hardness increases with the strengthening of silicon carbide during wear and tear effect of projected load on wear rate of carbide and non-reinforced samples using loads (5, 10, 15) Newton for twenty minutes of silicon. And the results showed that the increase in the projected loadThe rate of wear increases, the wear resistance decreases, and the smallest wear resistance of samples not SiC-fortifiedAlso, as the slipping speed increases, the wear rate increases for the SiC-strengthened samples(Dr. AqeelZahir 2008): Explain the effect of adding iron and lead to the alloy (Al-13% Si) On phases, friction and wear characteristics during sliding of this alloy under slipping conditionsDry on a carbon steel disc under the influence of a wide range of different loading pressures MPa (37.4-187.3) as shown by an X-ray examination. The phases present in the Al-13% Si alloy are (phase-phase and primary silicon), either as an alloy (Al-13% Si). -2% Fe-2% Pb) It was found that there are three phases, which are lead phase and the Uticake phase and the fragile Fe₂Si₂Al₆ phase, which is the reason for the increase in wear rate due to its fragility when increasing the loading pressure and found that The coefficient of friction of the alloy after adding iron and lead increases with the increase of the projected load. It also shows the presence of wear mechanisms that occur when adding iron and lead. Mineral, they occur as a result of the loading pressure having the ability to completely break down the agaidis formed on the exposed surface of the wear, as wear mechanisms depend on the phases of the alloy floor and its hardness in addition to the loading pressure.

(Zikra Mahdi, 2009): adding glass by (5% -3% -1%) for pure aluminum using Vortex technology (mechanical stirring) and the results of mechanical properties have shown an increased resistance Compression, yield strength and hardness resistance by increasing the reinforcement material (increasing the proportion of glass) either Wear tests. I used the screw method on the disk with a load of (20N) and quickly Constant slipping (2.7mm / sec). Tests have shown a decrease in wear rate, with an increase in the material percentage Relay.

Dey and his group, 2009): his study summarizes the wear and tear mechanisms at low loads for Al-18.5Si alloy.) The alloy is prepared using a sand plumbing method at high sliding cycles, and has been used. The way of the nail on the disc to test the wear and tear and use a load of (5 N and a sliding speed (0.05mm / sec), which led to the breakage of silicon granules into fine granules where they work These granules, as an oil, reduce friction forces and thus lead to reduced wear and tear, and improve Wear resistance at low loads.

Santos (and his group, 2006): I am interested in the corrosion behavior, as his study of Al-26.64% Si-5.2% Cu alloy () produced by the method of spray formation and I used the spectrum blocking method. Electrochemical in acid solution (PH = 3.3), neutral solution (Ph = 7) and finally solution Base (PH = 11). The results showed that the acid electrolyte causes a local attack Severe disability decreases with the time of immersion inside the solution, either in the neutral medium an attack occurs On an area less than a piece, and in the base medium, corrosion products are formed within the first hour From immersion, the obstruction increases, but the thickness of the surface layer leads to the growth of cracks that expose the surface to decreased disability over this period. This behavior studied.

(Najm and Abdel-Amir Student, 2008): Interested in studying the wear and tear behavior of Al-20% Si alloy.

Pure aluminum and 20% pure silicon were added, and the casting process was performed Cylindrical and used (Pin on Disc) to test the wear and tear, and another alloy was prepared Of Al- 20% Si)) and some elements were added (0.03% Ti) and (0.09% B) added Walk on Sr, sodium, and phosphorous in the form of salts for the purpose of knowing the effect of each of these The elements in the modification of the shape of the primary silicon minute phase and the yottic phase, and wear test Using a load of 12.5N and a duration of 30 minutes, it was found that the wear rate decreased and the wear resistance increased When increasing the percentage of silicon components and casting elements, as well as the alloy hardness containing Silicon and casting elements are high up to (94-135 HB) higher than the usual alloy Al- 20% Si, whose hardness is about (75-76 HB), and a rapid cooling of the alloy has been performed. The container contains alloying elements by extinguishing with snow from (150 ° C) and has obtained a microscopic structure Very fine for granular granules of the size (120 μ m), which is why they increase hardness Ingot.

Anandkumar (and his group, 2007): attended a compound of Al-Si and their effect was studied A coating layer on the compound material using the laser cladding method. The powder mixture is Al-12% Si) with an amount of 30% SiC. One of the important things that was included in the study are the standard factors on the microscopic composition and wear resistance, as indicated by Examination of the microstructure. The appearance of the α -Al phase and the Al-Si α Uticec phase. Among other results, the initialization of the coating at the highest specific energy (58MJ / m³) represents hardness (250HV), wear rate 1.7 * 10⁻⁴ g / sec). Whereas when the specific energy is 26 MJ / m³) it has a hardness of 120 HV) and a wear rate of g / sec) (0.43 * 10⁻⁴ where a load of 20N) is used to check the hardness and it has been shown that the hardness of the coating layer is It is higher than the base alloy, as SiC minutes are concentrated at the bottom of the coating layer when temperatures are low. The lack of similarity or difference between silicon minutes and a hand of

silicon and Al_4SiC_4 is not important for the hardness of the material, but this improves wear resistance, and as a result, the Si, Al_4SiC_4 phase increases. Hardness of the material by hardened dispersion. Likewise, it is important to rely on the main interaction between silicon and molten aluminum.

Singla (and his group, 2009): attended a compound material based on aluminum (98.41%). And he added to her a material for strengthening the car is in the hand of the silicon in different proportions (5%, 10%, 15%, 20%, 25%, 30%). The researcher studied the effect of the strengthening ratio on the hardness of the foundation and found that the strengthening rate at 25% SiC increases the hardness of the base material because increasing these minutes gives a high resistance For soft deformation the hardness increases by 45.5 HB as well as the shock resistance (36 N-m) becomes at 25% SiC and when we get the best hardness and shock resistance, I also used a method to distribute Granules homogeneously inside the base material where the method of manual mixing was adopted in a process Plumbing of the material and obtained the best specifications for the presence of the reinforcement material.

(Adnan Ibrahim Al-Jarr Jerry, 2010): Aluminum alloys are considered to be second-most important alloys

Steel, but aluminum extraction is expensive and needs energy, so the researcher studied the process of extracting aluminum from scrap in Iraq, where he took advantage of many of the scrap available in Iraq and studied the hardness and microscopic structure of the products after the smelting and casting process of the chosen alloys as I use the piston alloy of the engines which are within the categories of cast aluminum alloy 3xx.x as for the alloy of the hood is located Within rating Classification 4xx.x Finally, I used the aluminum alloy with the presence of 1% of the alloying elements, such as silicon and magnesium, which fall within the category 1xx.x. After the smelting process of the alloys, casting with special molds, and performing grinding and polishing operations with a 0.5-millimeter HF solution plus distilled water, then the models were photographed and the microstructure of the models was studied and the Vickers hardness scale (HV) was found, where it was found that the highest hardness we get is when mixing different proportions of the three alloys 20 % Of the alloy is 3xx.x, 40% of the 4xx.x alloy, and 20% of the 1xx.x alloy, where the hardness reaches 56.358 HV while the hardness of the piston alloy 51.941 HV and the hardness of the hood 62.782HV and the pure aluminum hardness 36.261 HV So the result must choose the appropriate mixing ratios of the alloys Scraps for obtaining alloys with properties suitable for engineering applications.

4- Studying the effect of heat treatment:

(Abudlwahab, 2008): Research on the Mechanical Properties of Al-2.1Si-0.7Fe Alloy, It has Mn manganese with a different ratio 0.1 - 0.5 (%) and used the heat treatment by heating to 490 ° C in an electric oven and

then quickly quenching with water the samples damped were freed with a degree of 200 C for 6 hr) before it cooled to the air. Manganese up to 0.4% increases UTS and hardness (HRB), but it reduces shock resistance and is believed to be caused by the interstitial phases Al₆ (Mn, Fe) & Al-Si-Fe-Mn) α that impede the movement of dislocations and then increase The tensile strength and hardness of Rockwell. As for the reduced impact resistance, it is due to a real interaction between erosions and sediments, so you need high shear forces, so they decrease. P shock but the shock of the properties of samples solidified Baltotaiq better than the basis for casted (explained these results in the plans for each of the alloy samples solidified Baltotaiq.

SWAMY (2010): Interested in studying the effect of heat treatment on resistance and wear and tear behavior

For Al6061-SiC alloy) as it added silicon carbide in different proportions (2% - 4% -6% -8% -10%) And the granular size (10-20 m m) where heat treatment was carried out by heating to C530 °,For a period of (1hr) and rapid quenching in different media (with water, air, snow). And aging at a degree of C175 ° for a period of 8hr)) Air suppression, also the wear test was carried out for the Al6061-10% SiC alloy)) and a fixed time of 15 min was used and different loads 5N, 10N, 15N, 20N)) and it was found that the wear resistance increases By increasing the SiCp components and the thermal treatment improves the wear and tear behavior of the Al6061 alloy (Al6061-SiCp). All of these previous results were illustrated with diagrams illustrating the effect of adding silicon carbide on hardness, tensile strength, and wear resistance without or with thermal treatment.

(Wahid & Abd 2009): Prescribed metallic composite material (aluminum) and ceramic reinforcement materials (Silicon carbide and alumina) using mono pressing in powders and drying and sintering at a degree of 500 ° C. It was found that the wear resistance is as great as possible when mixing ratio 12.5wt% SiC), 12.5wt% Al₂O₃) where the density is (2.5479 g / cm³) And the wear test was done below The effect of two conditions are load change and linear velocity change.

Summary

Present industrial developments are associated with materials having advantageous physical, mechanical and wear characteristics that can achieve technological needs. Aluminium and its composites are best suited materials as have better properties than unreinforced materials. Beneficial properties with reduced prices have enlarged their applications. Al MMCs are used in defence, aerospace, automotive, aviation, thermal management areas in engine pistons, cylinders barrel, connection rods, elements of vehicles braking systems

because of their unique properties of high hardness, high strength, high stiffness, high wear, abrasion and corrosion resistance.

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