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Effective of Heat Treatment on Physical Properties of (Ni-Ag) Iron Alloy Type

Afrah Hassoon Oraibi[†], Abdalrahman Al-Salihi[‡], Kadhim K. Kahlol[‡†], Ahmed A. Taher [‡‡]

[†] Department of Electrical Engineering, College of Engineering, University of Kufa, Najaf, Iraq.
[‡] Department of Basic Science, College of Dentistry, University of Basrah, Basrah, Iraq
[‡†] Ministry of Higher Education and Scientific research, Al-Furat Al-Awsat Technical University, Najef, Iraq
[‡‡] Mechanical Dept., Engineering Faculty, University of Kufa

*Corresponding Author Email: afrah.aljuburi@uokufa.edu.iq; ahmed.abosabeeh@uokufa.edu.iq; abdalrahmanalsalihi@gmail.com; Kadhim.k.kahlol@atu.edu.iq

ABSTRACT

Preparation an alloy with a composite structure was prepared using metallic technology (60 percent nickel, 25 percent silver, 15 percent iron and other materials). The dried ingot was stored under 6 tons of cold pressure at room temperature for 30 minutes, and the curing process was carried out at different heat treatment energies (0, 20, 60, 100) mJ for the purpose of studying the effect of heat treatment on the values of density, porosity, water absorption and magnetism and stiffness (Vickers method). The effect of heat treatment on corrosion resistance was examined by immersing the samples for different periods in a solution (3.5% NaCl). It is (2,4,6,8,12) days. The results showed that the porosity and water absorption rate decreased after treatment with an increase in the hardness value. In addition, the wear resistance decreases with an increase in heat treatment energy and a decrease in magnetism with an increase in heat.

KEYWORDS

porosity, Magnetic, Physical properties, hardness, Fe-Ni-Ag alloys, corrosion resistance

INTRODUCTION

Near temperature, Ag-Ni alloys with a metallic element concentration of concerning (35%) have an especially low thermal growth constant that's nearly "invariable." As a result, they are referred to as alloy alloys [1]. instability of ferromagnetism within the (F.C.C) is assumed to be the reason behind these anomalies [2, 3] This instability has been determined through an experiment, as an example, as a speedy come by Curie temperature at high [4, 5] alloys area unit chosen for using that require higher and close heat, distinctive electrical, and hot temperature and liquid corrosion resistance [6-7] Up to five hundredth of nickel is also gift within the steel. Nickel contributes smart malleability and smart resistance with reduces machinability within the vary of (2-5) % [8-10] alloy alloy could be a metal utilized in applications that embody dimensional stability (such as tanks, pipelines, preciseness machine tools, preciseness pendulums, electronic transistor also pressure gauges) similarly as elastic stability (like springs, customary frequency, and standardisation forks) [11-16].

PREPARATION OF SAMPLES

Under Room temperature will be prepared a samples of composite materials (Fe-Ag-Ni) alloy was created high purity materials containing 99.95 % iron and metallic element. For the aim of getting ready (Fe-Ag- Ni) alloy with these powders are mixed (63 % Fe-37 % Ni +Ag). The powders were then compacted during a steel mildew below cold pressure at 6 tons for cylindrical samples with dimensions of 15 metric diameter and 4 metric thickness. Then, employing heating source with totally heating energies (0, 20, 60, 100) mJ, and pulse period – 10 sec of a 100 cm, surface treatment of samples was performed. After that, diffraction and Atomic Force magnifier experiments were performed. The apparent density, porosity and water absorption were measured by drying samples for an hour using the Archimedes method (oven temperature at 100 ° C). The samples were weighed to determine the dry weight (Wd)., after removal from the oven. Then the samples immersed in a pot filled with water for a period of 24 hours. Then, they were taken out of the water and dried off, and from water drops stuck up on its surface by a cotton cloth to make sure that the samples do not presses by cloth, so that the water in the external pores of samples is not pull. The next step is to measure the samples again in order to determine the saturated weight (WS). The sample weight was calculated in a suspended method. The saturated sample with water was subsequently put on the grid for weighing and hanging in water and this weight reflects the hanging weight (Wi).

$$A.D = W_d * \rho / W_d - W_i \quad (1)$$

Where ρ is the density of water (gm/cm3). Whereas the apparent porosity (A.P) was found by the mathematical relationship [17].

$$A.P = (W_s - W_d / W_s - W_i) * 100\% \quad (2)$$

The value of water absorption ratio (W.A) can be determined by the following equation

$$W.A = W_s - W_d / W_{di} * 100\% \quad (3)$$

The samples were then prepared by cleaning and weighed by using balance type, and immersed into a solution (3.5% NaCl) for different periods time (3, 5, 7, 9, 11) day, after that, the samples were extracted from the solution and dried and finally reweighed. The amount of weight loss was calculated by given equation

$$W = M_g - M_i / A$$

Since the Mg work to block the sample before immersion in the middle of erosion, and Mi is Block the sample after a period of immersion, whereas, a represents surface area of sample.

RESULTS AND DISCUSSION

Figure 1 indicates visible sample density as a function of the temperature of the touch surfaces. One can clearly see that the apparent density increases as the annealing energies increase. It may be attributed primarily to reduced pores and increased homogeneity of alloys.

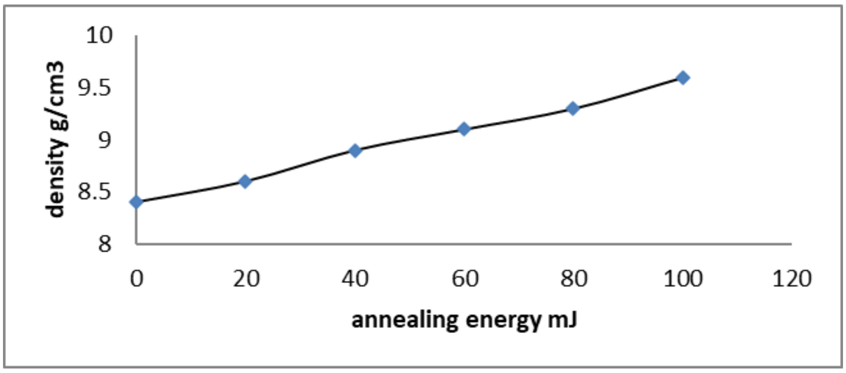

Figure 1. Density with annealing energy

On the other side, Figure 2 appear alloy's porosity values as annealing energy, while Figure 3 The annealing energy is displayed. All statistics indicate that when annealing energy increases, porosity and absorption decrease. Increased bonding between powder grains is the outcome of this energy. These pores, on the other hand, shrink and change form. They are consistent with virtual density and conduct inversely, according to porosity and absorption studies.

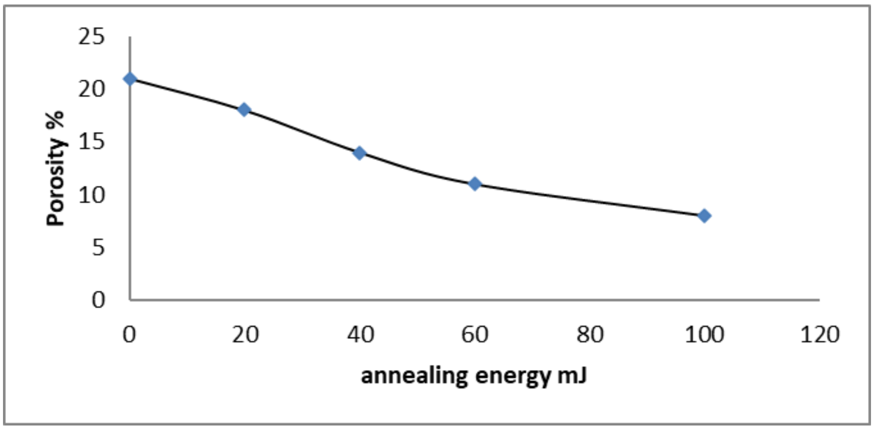

Figure 2. Porosity with annealing energy

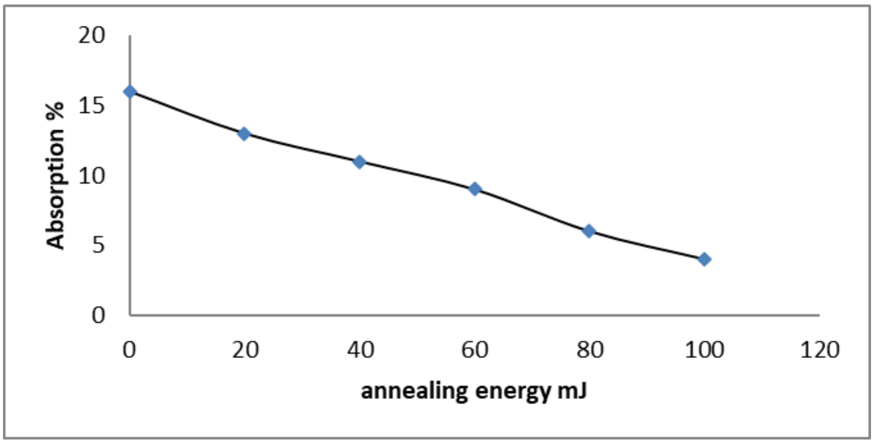

Figure 3. Absorption with annealing energy

Figure 4 illustrates the significant amount of sample weight loss as a function of immersion duration for different annealing energies (0, 100) mJ. The result shows that as the immersion time increases, the corrosion resistance diminishes. This behavior is due to a decrease in bubbles and an increase in bonds with the heat treatment of the surface.

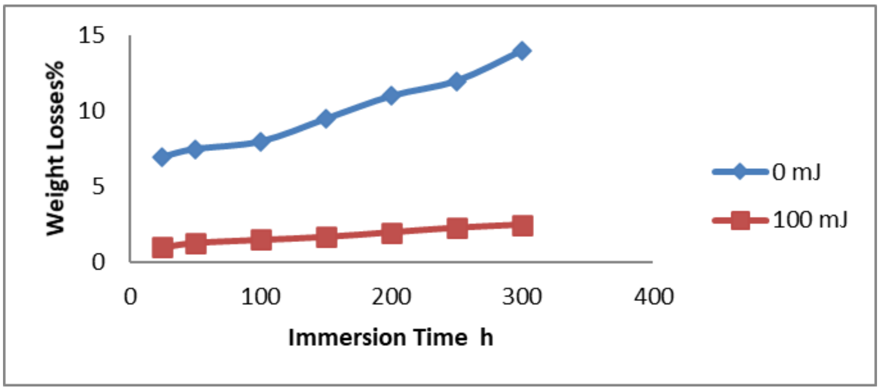

Figure 4. Weighting losses with immersion time

Figure 5 shows the generator for apparent weight changes due to magnetic forces on the sample as a function of temperature. It shows a consistent weight percent up to 290, indicating the start of the Curie transition, which is typical of magnetic attraction materials. The alloy's Curie point of 317 (Tc) is significantly lower than that of pure Ni, which is 354. The blending of Ni with the nonmagnetic Ag results in a significant decrease in Tc of Ag–Ni.

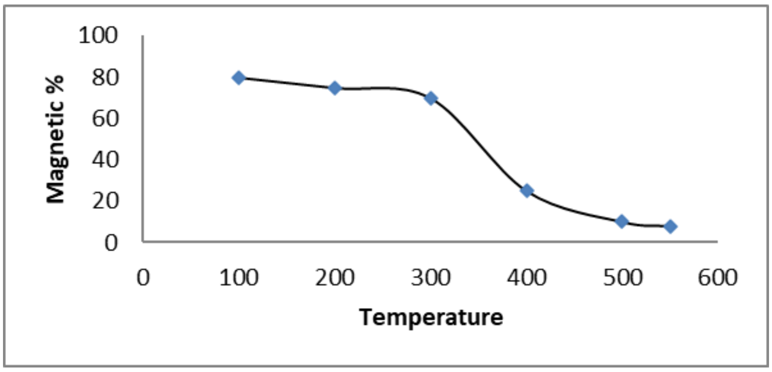

Figure 5. Magnetic field with difference Temperature

Figure 6 The sample's hardness values (VHN) (gm / mm2) at various sintering temperatures are also shown. The sample hardness values increase with annealing energy, as shown in this graph, resulting in work-life balance.

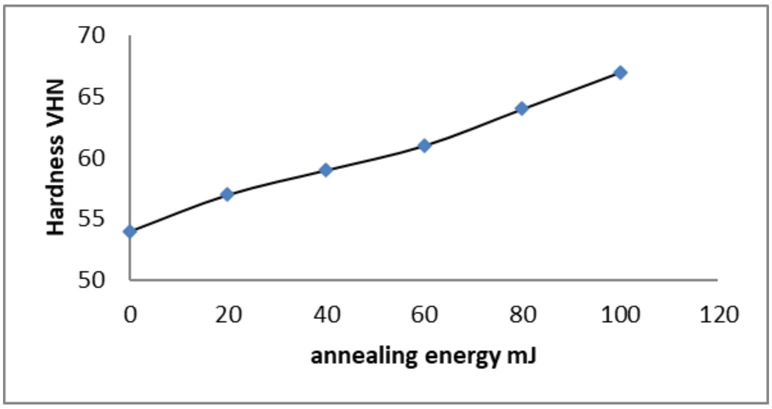

Figure 6. Hardness with annealing energy

CONCLUSIONS

As a general overview of the study results, there is a good response with annealing energy between apparent density and hardness values. In addition, modulation of porosity and water absorption is possible by treating the annealing surface by regulating the energy, and a inversely relation between the magnetic energy and temperature. Furthermore, the positive sign obtained by increasing annealing energy also improves the corrosion resistance and this may open up the possibility to enhance the sample properties.

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