The Influence Of Nanofluid On Mechanical Property Using Heat Treatment Process

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Abstract- Heat treatment process is a change in the grain size of the steel component by either heating or cooling to increase the strength of steel called heat treatment process. It main aim to improve the mechanical property or a combination of different mechanical property so that the metals and alloys will be more useful serviceable and safe for definite purpose this is the conventional beneficial of heat treatment. In this paper we see what effect it brings to the mechanical properties of material if we use nanofluid to conduct heat treatment. Here the conventional base fluid is replaced by the Nanofluid. A Nanofluid contain nanoparticle whose size are ranging between1-100 nanometre. In this the entire focus is on the change in mechanical property. Mechanical property are the physical property of material that come into play under the application of load on the material. It is an important aspect for any material as it defined the service life and usefulness of material.

Key Words – Heat treatment, Nanofluid.

I.INTRODUCTION

A. Nano-fluid:-

A nanofluid contain nanoparticle i.e. nanometre-seized. In this fluid the suspension of nanoparticle take place in base fluid. Nanoparticle are the particle whose size are ranging between the 1 -100 nanometre in size and are made of carbon, metal, metal oxide or organic matter. Most commonly used nanoparticle in the nanofluid are typically made up of metal, oxide, carbide or carbon tube Nanofluid have unique property that make it suitable and useful in many application like heat transfer, fuel cells, heat exchanger, refrigerator etc.

The most important use of nano-particles in heat treatment applications to increase thermal conductivity and the convective heat transfer coefficient compared to base fluid. As the two elements control the quenching cycle

- Thermal conductivity
- Heat transfer coefficient

The use of nanoparticles will increase both the factor and the speed and strength of the quench which would definitely aff ect the cycle of heat treatment

APPLICATION OF NANOPARTICLE

S.NO	INDUSTRIAL SECTOR	NANOPARTICLES
1	Agriculture	Silver, Silicon dioxide, Potassium, Calcium, Iron, Zinc, Phosphorus, Boron, Zinc oxide
2	Automotive	Tungsten, clay, titanium dioxide
3	Enviorment	Silver, Titanium dioxide, clay, gold, and selenium
4	Renewable energies	Titanium, palladium, tungsten, silicon, clay, graphite
5	Electronic	Silver, Alumiunm, Silicondioxide

B. Mechanical property:-

Mechanical properties are the physical properties of material which come into play when force is applied to material. Mechanical property of any material is an important parameter for determining the service life and usefulness of material .There are many important mechanical property of material are:-

- Strength – It is the material's capacity to withstand attack. Product quality is needed to prevent faults. Based on the type of load the strength under tension, compression, shear action to considered.
- Rigidity- It is structural strength to resist deformation. It is important for member whose deflection are to be limited by the service requirements.
- Toughness- It is the availability of material to resist the fracture due to impact load. This property is defined in part for impact load.
- Ductility- It is property of material, enabling it to be drawn into wire with the application of tension force. This property also describe to relief stress concentration under static loading.
- Brittleness- It is structural capital, in contrast to ductility. When a substance splits easily if shocked it is said to be brittle.
- Malleability- This Property helps the substance to change the shape under compression, without cracking.
- Hardness- The land is concerned with such issues as wear resistance, scraping, deformation, machinability.
- Fatigue- As material undergoes fluctuating or repetitive loading, it tends to develop a characteristic Behaviour that is distinct from that material under steady loading.
- Creep- It is slow plastic deformation of metal under constant stress or under pro-long loading usually high temperatures.
- Elasticity- It is the material property that helps it to restore its original shape and size upon elimination of the load.
- Plasticity- It is availability of material to be permanently deformation with fracture even after the load is remove
- Resilience- It is the total energy absorbed by the material during its elastic deformation
- Stiffness- It is resistance of material to elastic deformation and its expressed by modulus of elasticity

II.TYPE OF HEAT TREATMENT

A. ANNEALING – In annealing process the specimen is heated the upper critical temperature and is cooled in furnance (varying slow cooling) so that the removal of residual stress and ductility of hardening component .

a) Type of annealing
b) Full annealing
c) Stress relief annealing
d) Process annealing
e) Spheroid annealing

B. NARM0LIZING - The process consist o heating to just above the upper critical for hypo eutectoid steel and above upper critical temperature for hyper eutectoid steel by 50^0C. In this process theirs is loss in ductility material and improve the strength and machine.

C. HARDENESS - The conventional hardening process consist of heating the steel above upper critical temperature for hypo eutectoid steel and above lower critical temperature for hyper eutectoid steel by 10^0C. It increases the hardness.

D. TEMPERING - The process consist of heating the hardened components to temperature between 100-700 degree holding at temperature for 1-2 hrs and cools at room temperature usually in air. The high internal stress produce due to hardening are likely to cause cracking of component if tempering is delayed therefore tempering should immediately done after hardening.

III. LITERATURE SURVEY

1. This Research is based on the modification of 1045 steel by using (NbTi)C nanoparticles. In this the modified steel is made by melting the base steel and adding (NbTi)C nanoparticles in that and that modified steel is further use for the case study of microstructure analysis and to determine the various property using different heat treatment process which includes normalizing, Base metal , Quenching and tempering at different temperature and also determined the particle size of nano-particles. They perform smelting and heat treatment process first they perform normalizing at 890°C and held them in box resistance furnance and air cooled. After they performed another method quenching and tempering is done at 850°C and quenching is done at 10%Nacl solution. The quench steel tempered at two different temperature 500°C and 600°C for one hour and finally air cooled at room temperature. After that the fine and uniform microstructure

of steel is observed by SEM analysis by observing modified and unmodified steel it is found that strength and elongation is increases strength increases by 58% to 40.3% and elongation increases by 18 to 16.5%. In this different effects are obtained by different heat treatment methods and found that grain refinement improves strength ductility and elongation of material and hardness also increased

2. The aim of this research is to produce Mn0.5Zn0.5Fe2O4244 nanoparticle by using Magnese, zinc, iron nitrite and polyvinyl pyrrolidone. After producing the nanoparticles it is the stead by various heat treatment techniques like XRD, SEM, EDX spectrum analysis this research contribute various advantages of thermal treatment technique such as control growth of the size partices, particles agglomeration, toxic production prevention for this time required is less. In this nanoparticles is produced by calcination technique at different temperatures and using deionized water at 70 °C244and 2 hours of stirrer. After that they performed thermogravimetric analysis for the purification of nanoparticle at different temperature. In SEM analysis surface morphology of prepared sample is examined which shows grain size at 500°C. EDX gives the atomic composition of the product using calcinations technique in which they found that Au has detected.

3. In this paper present the modelling of the specification heat capacity (SHC) of CuO/water and nanofluid using support regression (SVR) and artificial neural network model. The accuracy of the develop model in estimating of (SHC) of CuO/water nanofluid was assed using statistical and graphical analysis. In this paper nano technological devices contributed to development of highly eficient cooling fluid. In a nanopartical important of thermal and transport properties of the fluid. The SVR result presented slightly higher accuracy than that SVR result. the propoesed machine learning based model proved an alternative approach toward move accurate computation of the SHC of CuO/ water nanofluid.

4. In this paper synthesis and growth mechanism of CeVo4 nanopartical successfully synthesis via hydrothermal. The composition and phase purity of the products were examine by XRD technique. In this paper a simple and mild surfactant assisted hydrothermal approach for selectively preparing nano modes. The hydrothermal temperature precursor solution concentration were found to play imported role in determine the morphologic. On the basis of these to improve the mechanism properties.

5. In this paper we have studied about the effect of nanoparticle on the quenching process. In this they are taken different nanofluid which contain nanoparticle like silica, alumina, titaania and copper oxide with water as a base. By performing a experiment they have found that the silica nanoparticle enhance the performance of boiling heat transfer and it is best coolant for the quenching among the other nanoparticle. It is also found that the adding nanoparticle in the base fluid such as oil or water or ethylene glycol can increase the thermal conductivity by dispersing the solid particle. When we compare conventional base fluid with the nanofluid we found that conventional fluid have poor heat transfer properties.

6. In this paper ZnO nanofluid was prepared by two step method firstly ZnO nanopartical synthesized by wet chemical method such as polyvinyl alcohol and zinc nitrite hexahydrate , silvernitrate . The dispered aqueos solution of polyvinyl alcohol sucrose heated at 65C to 75C after decaying settled ZnO nanopartical collected and climates at 500^0 C .In next step the nanofluid is prepared by despairing nanopartical at various low volume concentrated =0.02%, 0.04%, 0.06% &0.1% nanofluid were to study ZnO nanopartical are insoluble in water after some time the nanopartical were settled down after mix with water.

7. Water based Fe2O3 nanofluid are show more excrement in thermal conductivity and convert heat transfer coefficient then ethylene glycol based Fe2O3 nanofluid having low viscosity .In this behaviour the augmentation in the thermal performance is associated with increase in thermal conductivity , Brownian motion and frictional force between nanofluid and is particles .The amount of heat transfer was significant in the heat exchanger during first half of thermail boundary layer . It study also concluded that enchacement in heat transfer in heat treatment to transfer the coefficient to the heat exchanger. Increase in heat transfer coefficient was directly related to concentration of nanopartical more number of nanopartical in fluid improve thermal property.

8. The main aim of this paper copper ethylene glycol nanofluid. Which is synthesis of EG based copper nanofluid via single step and tow step procedure using sodium pophosphite by chemical reaction method, there was performed heat transfer coefficient (HTC) by various Reynolds number at various design heat exchanger setup. Thermal conductivity rheological behaviour in both steps. After perform all processes in both step nanofluid then the result that is stability and good dispersion of nanopartical important for the cooling properties.

9. In this paper the synthesis of copper nanoparticales or nanopowder for the use nanofluid. Make the produes consist of using sodium ctrate and 50 nm powder dispersible in the ethylene glycol (EG) and water and this produce was synthesis

continuous. The sodium crate is found by using method continuous stirred task reactor (CSTR) to high particles loading and the produce 50nm powder. The production of this copper nanopowder is very low by using (CSTR) method. Then correct price and it can be used for large scale uses of nanofluid. An enhancement was check by prepared Cu-EG nanofluid and it show good or high enhancement in EG from Cu nanopowder.

10. In this paper the copper-water nanofluid and their viscosity. Which is dependent on the temperature and volume fraction of a nanopartical. The velocity and temperature of copper water nanofluid is high to varies viscosities parameter by nonlinear system is presented. If an applied magnetic field there of nanofluid is performed through analysis by using new model for temperature. The high volume fraction effect on the viscosity of the velocity of the channel. When variable viscosity increases then high velocity and temperature of fluid are enhanced and effective velocity of fluid then get resul fluid is easily flow.

IV. CONCLUSION

In this we have studied different paper and found that in each of the paper they have performed. Different heat treatment process or different experiment using nano-fluid which directly affecting the different mechanical properties of material, So in this paper we have successfully studied about the influence of nanofluid and the mechanical properties of the material.

V. REFERANCE

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