CHAPTER II

REVIEW OF LITERATURE
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LITERATURE REVIEWS OF THE WORK DONE AND MOTIVATION FOR THE PRESENT WORK:

The material surface modification is a very important task. It involves the number of techniques, methods, phenomenon and processes. The metal or alloy surface coating by conventional methods is well known to all. There are many inventions based on the facts that previous work supports the future research work. The numbers of observations are recorded and findings have been put forth on the study of corrosion behavior of all the metals and their alloys, methods used for their study, techniques required for the modification of the surface and characterization of their results. The selection of materials, chemicals required and processes of initial sample preparation is very important in the research work.

The study of corrosion behavior of maraging steel in the sodium acetate and ascetic acid buffer solution and potentiokinetic polarization technique along with its antimicrobial activity in the potable water have been reviewed. The study of material surface coating, ion implantation, ion beam induced atomic mixing, pulsed laser irradiation, laser surface melting technique and antimicrobial activity of metals and alloys is the research problem selected by us. The previous research work of the number of research workers have been studied and put forth in the form of literature reviews. This is our motivation for the present research work.

The maraging steel is an alloy formed by number of constituent metals mixing in the iron which is susceptible to the corrosion in the aqueous media especially in acidic media [Rohrbatch et al., 1990]. The maraging steel alloy is prone to the corrosion though it is having ultrahigh strength. The selected samples consist of 18% nickel along with cobalt, titanium, molybdenum in substantial amounts. It is actually low carbon steel alloy. As per demand and application we can change composition of maraging steel [Stillier et al., 1996]. The strength of maraging steel can be increased largely by aging at 480 °C. At this stage the precipitation of metal took place. Such material has low thermal expansion and high modulus of elasticity. The
better thermal conductivity was observed. This reduces surface temperature and lowers thermal stress of the material [Klobcar, 2008]. Grum et al. observed that maraging steels are very useful for number of applications because it has very high strength, toughness is moderate and weld ability is very good [Grum et al., 2006]. The maraging steel is extensively used in military applications such as submarine hulls, preparation of rockets etc. It is also useful for the gears, bearings, turbine components and crankshafts. These applications are based on the properties viz. strength and malleability [Rezek et al., 1997]. The weld ability of the maraging steel is very important concern of fabricating materials. It was showed that the maraging steel welding is possible in solutionalized condition at low temperature (480 °C). Its use in large steel fabrication is possible after post weld condition [Adama et al., 1964]. Poornima et al found that the depths of pit turned shallower than that of steels having very high strength [Poornima (3) et al., 2011] [Dean et al., 1965].

The maraging steels can be hardened by a special process in which mechanical reaction is involved which do not include carbon. In all the industries, corrosion of the material and structural elements is considered to be major issue [Sastri et al., 2003]. The inhibitory action should be performed in special environment and with appropriate inhibitor. This type of steels strength can be increased by age hardening process of very low carbon content iron-nickel matrix [Rohrbach et al., 1990]. The characteristic properties of the maraging steel are low carbon content, high strength, weld ability, high corrosion resistance and high ductility. Due to these properties, it can be used in the aerospace and aircraft industries [Lee et al., 2005]. If the 18% Ni maraging steel is exposed to the atmosphere then it corrodes uniformly and afterword becomes completely rust covered [Kirk et al., 1968]. These types of steels are found to have very low susceptibility compared with other steels having large strength. This was due to the very small diffusion of the hydrogen [Rezek et al., 1997]. There are number of research papers published related with study of properties of maraging steels [Sinha, 1982]. Foud S. showed that the corrosion resistance may change reciprocally with the concentration of solution of sodium chloride. In the sodium carbonate solution the film formation takes place while in sodium sulfate solution the passive film is dissolved. If the maraging steel is placed under the treatment, there was no effect on the corrosion resistance [Foud, 2012].

The variation of corrosion potential and pH of the radioactive water showed that intermediates remain upon the maraging steel surface. There are dependent changes of potential
and pH of the solution [Bellanger (2) et al., 1996]. In the earlier paper, Bellanger reported that the there is no change in ions of carbonates. This was observed at stable pH value of the solution concerned [Bellanger (1) et al., 1995]. If the surface or structure of the material is varied then critical as well as passive current densities goes on increasing. The material was subjected to the heat treatment. The similar study but with varied temperatures was studied by Sanatkumar et al. Their observations were based on potentio-dynamic polarization technique and electrochemical impedance spectroscopy. The solution used was hydrochloric acid [Sanatkumar et al., 2012].

The research work related with ion implantation and ion beam mixing have been reported using potentio-kinetic polarization under different conditions and parameters. The study performed by a research group showed that the rate of oxidation of copper can be reduced under specific situations [Hondros et al., 1962]. The Ashworth et al. studied ion implantation process and put forth their results in a systematic ways. They showed that if we implant high purity Fe, Al and Cu ions on the material by varying ion dose then there is change in potentiostatic polarization behavior of the base metal [Ashworth (1) et al., 1976]. The variation of current with potential was studied. The rate of corrosion was exactly determined near about the potential related with corrosion [Brandy et al., 1980].

The LASER irradiation technique is also found to be a suitable technique to modify the metals surface. Alloy formation is also possible using laser surface melting. This technique had been used to obtain very high resistive property of titanium which was sprayed on the surface of the material. The sea water was used for the study [Ayers et al., 1981]. The improvement in general corrosion is possible if we incident lasers upon the surface of alloys prepared by mixing aluminum and manganese. In spite of this, pitting resistance was not improved much in electrochemical studies [McCafferty et al., 1982]. The laser alloying is a material processing technology [Solunke et al., 2013]. If the high power laser is incident on the surface of the metal then characteristic properties of the base material are changed. The melting of the surface occurs in less than a second but base metal remains cool and acts as heat sink. There was very high temperature gradient between the molten region and the base metal. This caused rapid quenching and re-solidification [Draper et al., 1984]. The susceptibility of stainless steel (type 304) was changed against granular attacks by irradiating laser on the surface. The chromium ions were redistributed at the surface [Antony et al., 1978]. It had been studied that pulsed laser
can produce the large effect on maraging steel alloys surface. The composition studied was 5Mo-8Co-18Ni-69Fe by using SEM, IF and CEMS in a different way [Kulkarni et al., 1989]. There were no changes in the chemical composition at the upper surface with formation of austenitic phase. The micro hardness, corrosion resistance, friction, wear and surface properties were studied [Seshendra Ready et al., 2013]. In order to improve surface cracks, it is better to incident lasers on the surface [Kirk et al., 1968]. The cracks and residual stresses can be reduced with the help of re-melting process happening in surface formation by lasers of the 12 Ni maraging steel [Grum et al., 2006]. The corrosion behavior study related with surface modification by high power lasers showed that corrosion can be controlled as well as adhesion and pilling can be improved [Damborenea, 1998] [Hao, 2006] [Kac, 2004] [Lawrence, 2001] [Martan, 2007].

The corrosion behavior of 316L stainless steel alloyed with industrially sintered copper had been studied [Fedrizi et al., 1991]. Molinari put forth his observations related with mechanical properties of steel which was pre alloyed slightly with chromium-molybdenum powders [Molinari, 2000]. The bending of sintered alloys having different microstructure effects was studied practically as well as theoretically [Bertiny et al., 1996]. The sintered duplex stainless steels mechanical and corrosion properties can be changed by studying its behavior [Kazior et al., 2000]. The plasma treatment study to control corrosion of Cr-Mo coated steels have been done in a comparative way [Straffelini et al., 2001]. The nano structured maraging steels were alloyed mechanically and corrosion behavior was studied [Menapace et al., 2010]. The study had been carried out related with treatment of laser on the surface of 17-4pH stainless steel [Vicente et al., 2010]. All the above studies showed that no one studied the corrosion behavior in sodium acetate-acetic acid buffer solution of maraging steel by depositing chromium and irradiating laser on it.

The antimicrobial activity of metals, alloys and different chemicals was studied by many researchers. Thiosemicarbozones and their derivatives study had been performed for the corrosion inhibition of metals. They are also useful as anti-tumor and anti-malarial applications [Singh, 2005] et al. [Arab, 2008]. The antimicrobial activity study had been performed using 18% Ni 350 grade maraging steels. The investigations had showed that the samples have moderate activity [Henrich, 2011]. The catalytic antimicrobial coatings which may capture and kill pathogens have been studied [David et al., 2009].
The Bauer-Kirby had investigated a disc diffusion method for the study of antimicrobial properties and activities [Bauer (1) et al., 1966]. The methicillin resistant strains of S. aureous were tested and put forth various advantages by Drew and his co-workers [Drew et al., 1972]. The investigation of Bauer et al. about the antibiotic susceptibility testing is very important and can be studied by modified standard single disc method [Jing et al., 2007] [Sheretz et al., 1989].

The detailed study of maraging steel and corrosion behavior, effect of laser irradiation, ibm and implantation of ions techniques had been carried by many researchers in different ways and using different aqueous media. The antibacterial effect had also been studied.

Poornima et al. [2010] had put forth the investigated new results in his research paper. The 250 grade maraging steel samples were aged and annealed for the study of the corrosion behavior. The phosphoric acid solution was used over a range of different acid concentrations. The temperature of solution was also varied. The technique used by them was Tafel extrapolation technique along with impedance spectroscopy. They found that the rate of corrosion of both annealed as well as aged samples, were increased. As the concentration of phosphoric acid increases there is drastic change in various parameters of the corrosion. The difference in the rates of corrosion may get widened for annealed as well as the aged samples as medium changes with temperature if the environment concerned. The thermodynamic parameters play vital role in the results. The entropy of the activation decreases but the enthalpy goes on decreasing continuously for some samples.

The energy required to activate has also to be considered in change taking place. All these three parameters were determined and the variations have been plotted at different temperatures by them. The micrographic images of annealed as well as aged specimens were taken by means of SEM. The observation shown by them reveals that there is interaction between acid medium and the surface of the sample. The variation or graphical representation of the different concentrations of the phosphoric acid solution with temperature showed that the resistance of the specimens changes dramatically. In other words, initially the resistance changes up to the -20V potential but as temperature of the solution increases, the net effect is that resistance goes on increasing slowly compared with starting variation.

It was also observed that corrosion current increases with the concentration of the solution of phosphoric acid for both the samples. The polarization resistance was found to be changed due to the concentration of the solution and the increase in temperature. The plots were
observed to be shifted to high current density regions. This indicated the increase in corrosion rate. The active corrosion was found to all the samples related with phosphoric acid concentrations and all temperatures. The shift in corrosion potential was accounted towards the noble values for annealed samples. But in case was an aged sample shift was more pronounced towards the right. Following conclusions were drawn by them.

1. It was noted that from the SEM micrographs that there is degradation of the corroded annealed samples.
2. The degradation was very pronounced for the aged samples if the temperature variation is undergoing in the separate environment. There may be difference in the potentials at the different temperatures.
3. At the grain boundaries, the inter-metallic precipitation may result. This is responsible for the higher corrosion rate.
4. The substantial corrosion rate was observed for both the samples i.e. annealed as well as for the aged samples.
5. The Arhenius law is followed by corrosion kinetics in the phosphoric acid solution in a perfect way.

The research related with sapless of maraging steel 250 grades have been done by various researchers group. The solution selected was hydrochloric acid (HCl) with different concentrations ranging from .1 M to 2 M. The temperatures were also different ranging from the 30°C to 60°C. They have used technique of electrochemical impedance along with polarization technique [Sanatkumar et al., 2011]. According to their review of literature that there is very few work done by researchers in the field concerned and so they selected this problem of corrosion behavior. As per their study, both the methods selected had many advantages. As per investigations done by them, the corrosion rate increased substantially with the increase if the temperature. Also it drastically increased to the high value along with increase in concentration of hydrochloric acid solution. They evaluated different parameters associated with corrosion such as active energy, potential and corrosion current density. These parameters were determined by using the Arrhenius equation.

The transition state study was carried out by them. In general, they found that there is good agreement between the results for both the methods used. The characterization was done
using the scanning electron microscopy. The surface morphological observations were compared for corrosion processed or weld edged samples and in corroded samples. There plots clearly showed the shifting of curves and hence corrosion potential towards the less negative values. The concentration of hydrochloric acid was varied accordingly. By using the electrochemical impedance spectroscopy, the graphs were plotted and studied its analysis. The graphical presentation showed the there is a transfer process of ions when the metal gets corroded in the hydrochloric acid. The corrosion mechanism was not altered though there is fast reaction and a change in the corrosion current takes place. The graphs as per the Nyquist criteria showed the semi circles perfectly.

The capacitance value calculated by them was controllable by the presence if transfer mechanism. The charge transfer resistance was changed consequently followed by the double layer capacitance decrease. The increase in capacitance value was associated with desorption of the chloride ions produced during the process of corrosion at the metal surface. The scanning electron microscopic images were taken at different magnifications to observe the surface morphology in better way. The dipped sample showed the roughness while the sample which neither was nor dipped showed that there was no any effect on the surface of the metal. The surface was found to be smooth. This was due to the over potential produced by the hydrogen evolution. As the concentration increases the metal deterioration went on increasing. At the concentration of 2 M of HCl, The conclusions drawn by them were as follows.

1. The complete deterioration took place. The particles were detached for the corroded surface.
2. The samples for the study showed the inter-granular corrosion. They were detachment of the particles.
3. At the surface of the specimen the effect was more pronounced.
4. The effect observed was galvanic in nature. This was taken place between the matrix and the precipitates along the grain boundaries.
5. The corrosion rate was affected by the temperature.
6. The concentration of the solution of hydrochloric acid also affects the corrosion rate.
7. The rates of corrosion were found be in good agreement for the both the samples.
8. The Arrhenius law is obeyed by the characteristic corrosion took place. During the process of the corrosion.

The techniques potentio-dynamic and galvano-static polarization techniques can be used to study the corrosion characteristics of the stainless steel. Its type was 304 and the solution used was .5 M sulfuric acid. The variation in the acid concentration was done to observe its effect along with the voltage scan rate [Abdallah, 2003]. He studied the inhibitive effect related with given solution. The 4-substituted pyrazole - 5-ones were considered for the observation. The adsorption at the surface was found to constitute to inhibition compound under the consideration. The interpretation of the effect was considered to be related to the mesmeric effect and the inductive effects. It was observed that there is co-relation between the results obtained in the both the cases. The inhibition efficiencies were not up to the satisfaction.

These efficiencies went on increasing with the acid concentration increase. The material selected was having importance in industry as well as for household application. This type of steel is generally called the SS type steel. According to them if there is much improvement in the corrosive properties then we can have wide applications i.e. industrial acid cleaning and well acidizing. The inhibitors were found to be increasing the performance of the material and they are reducing the corrosion attack on the surfaces of the samples. We can use adsorption compounds to act like inhibitors. The electrode surface was affected by the acid solution under the consideration. He also studied the chemisorptions inhibition mechanism happening during the corrosion mechanism. The ability of the absorption changed slightly during the process. The electronic structure also affects the efficiency. There was found to be the co-relation in the inhibitor performance and the temperature variation. Also the corrosion characteristic current was found to be improved. The nitrogen, sulfur and oxygen were found to be responsible for the change in parameters related to the phenomenon.

If we expose any material to the environment, it gets corroded. Steels are affected by the environmental effects. The phenomenon of the corrosion usually depends upon the various factors such as alloy composition, concentration, pH etc. Whenever there is weak acid the reduction of oxygen is involved along with the dissolution and diffusion control. The hydrogen ion concentration affects the rate of corrosion reaction. In case of carbon steel there will be sever attack of corrosion. Abdullah put forth following conclusions.
1. The environmental conditions always affect the corrosion of any metal or the alloy, particularly the surface of the material is affected. The corrosion of the metal is mainly due to the moisturized part of the environment.

2. Initially its rate is very low or the process is considered to be slow. But, after words the speed of deterioration goes on increasing by aqueous media i.e. H₂SO₄.

3. The corrosion was found to be dependent on the electrolyte parameters such as pH, temperature and the oxidizing power. If there is weak acid or the neutral solution is there then the corrosion oxygen reduction must be considered.

4. Three anodic peaks and the passive region were observed.

In .1 N sulfuric acid, if the addition of the phosphorous takes place at the surface then the deterioration may occur. This can be avoided by deposition the chromium on the sample. The deposition increases the corrosion resistance. If the phosphorous addition of the order of .25 wt % is there, then we can have excellent corrosion properties. The protective passive film is the main reason behind it. In the acidic environment, we can have chromium deposition and copper added alloys for the protection of the corrosion attack. In acidic medium the beneficial factor is found to be the phosphorous. The study of corrosion characteristics had been formed in three different solutions by taking the two P/M phosphoric ions with .00 wt % C. The material was alloyed by Cr.

They selected three environments as sodium chloride (pH 6.8), hydrogen sulfate (pH .6) and buffer solution sodium carbonate and sodium bicarbonate pH 9.4). The techniques used were linear polarization and tafel extrapolation. It was observed that corrosion resistance can be increased by depositing the chromium metal in with 500 nm thickness. In both techniques the result were determined and compared with each other. The rates of corrosion were higher on acid medium. This was due to the large evolution hydrogen. These rates were very low in the alkaline solution. In the neutral medium the rates were low compared with other solutions.

The surface morphology was studied using scanning electron microscopic photographs. The x-ray mapping was used for the characterization purpose. The phosphoric iron and Armco iron samples were used for studding the behavior of corrosion. The cathodic reaction taking
place in the phenomena was responsible for the destruction of the material or the sample surface. The evolution of hydrogen was found to be pronounced up to the some extent. But beyond that the rate goes on decreasing. They had drawn conclusions as follows.

1. It can be understood that the corrosion rate varies with the concentration on hydrogen ions present or liberated during the process.

2. If there is plain carbon steel then there will be more severe attack. The localized attack on the material has been observed in the marine environment especially in the salty environment.

3. Whenever there is segregation of phosphorous to the grain boundary then there is always the inter-granular attack. This was observed to be resulting into the stress corrosion cracking.

4. The stress corrosion observed was more pronounced in the acidic medium but were found to be low in the aqueous medium.

The study of the maraging steels inhibition in the corrosive media had been done in the 0.67 M phosphoric acid. The Potentio dynamic technique along with EIS technology was used for study The DMBTSC (3-4 Di-Methoxy-Benzaldehyde-Thio-Semi-Carbozone) was used in the study [Poornima et al., 2012]. The adsorption isotherms were studied for different DMBTSC concentration values and calculated values of different thermodynamic parameters. The langmur adsorption theory was used. The detailed behavioral changes were studied for the cathodic as well as anodic polarization studies. The Gibbs free energy was determined by them.

It was observed that if we add DMBTSC inhibitor with different concentrations then it is possible to reduce the anodic dissolution. Both the effects that are anodic and cathodic can be well studied by using the inhibitor of the type selected. Hence it is called mixed type of inhibitor. The evolution of hydrogen can be actively controlled as suggested by the cathodic Tafel curves having parallel nature. Due to the inhibitor r presence, the reduction mechanism cannot have any effect. There were slight changes in the increase in inhibitor effect as the concentration changed. The alloy was observed to be degraded. This was confirmed from the scanning electron microscope photographs of corroded samples. There were adsorbed layers of molecules on the surface of samples of alloy. Thus the material under study can be protected when such layer formation takes place. The scanning electron micrograph image of corroded annealed sample
showed degradation of alloy. The SEM image of annealed maraging steel after the corrosion tests in a medium of phosphoric acid containing DMBTSC. This clearly showed the adsorbed layer of inhibitor molecules on the alloy surface. This protected the metal from corrosion.

The conclusions put forth by them were as follows.

1. As concentration of inhibitor changes, the efficiency was found to be increased.
2. When the temperature was decreased, the inhibitor efficiency was increased. Thus there is reciprocal relation between the temperature and the efficiency.
3. When the concentration was very low, the corrosion was found to be reduced in a significant way. This was due to the addition of DMBTSC inhibitor.
4. For annealed samples corrosion was very substantial in the phosphoric acid solution.
5. The inhibition efficiency was increased with increase in inhibitor concentrations.
6. The inhibition efficiency was decreased with increase in temperatures.
7. The corrosion of annealed maraging steel in 0.67 M phosphoric acid was observed to be substantial.
8. The corrosion was significantly reduced by the addition of DMBTSC even at very low concentrations.
9. The DMBTSC inhibitor acts as like mixed type of inhibitor because the both the type of reactions viz. anodic and cathodic can be studied and have effect on the process as well as on the sample.
10. The phenomenon of corrosion is associated with the Langmuir’s adsorption isotherm model.
11. The inhibition efficiencies are in very good agreement for potentio-dynamic and EIS techniques.

There is tremendous research related with inhibitors. In one study the effect of DAMTSC on the maraging steel have been reported. The solution used was .5 sulfuric acids. The temperature variation was between 303 $^0$K to 323 $^0$K. The different techniques were used viz. scanning electron microscopy and potent-dynamic polarization technique [Poornima (4) et al., 2010]. In their research work, they had used thio- semicabozone derivative as an inhibitor. They have varied uses in the different fields. They are extensively used for the different investigation study in the chemistry. In biology also they are used as preservative for different zoological
species maintenance and preservation. To cure various diseases they are used in anti tumor and antibacterial applications.

The inhibition effect is more pronounced in the electrochemistry of metals and in the corrosion science. As per the study performed by Poornima et al., it had been used as an inhibitor for the maraging steel specimens. The behavior of corrosion was observed for the different temperatures. The concentrations were different for the different cautions but the specimen was the same. The Langmuir adsorption isotherm model was studied by them which showed mixed type of inhibition behavior.

It was observed that impedance plots show variation according to the different inhibitor concentration. There is much difference in the plots before the process of inhibition and after the process carried out. From the plots, they showed that at low frequency there was much surface dissolution. But in the presence of inhibitor this was reduced greatly. Thus we should use inhibitors during the anodic reaction. As temperature increases, the pronounced effects were observed. One semicircle was observed for low concentration and two semicircles were observed for very high concentration values. Thus the results showed that there can be film formation by the inhibitor on the surface of maraging steel. Such film formation is observed at very high temperatures i.e.303\(^0\)K.

The actual effect of given acid and sample show very different reaction at the surface. There was a very complex reaction. At the surface there are many reactions happening. All are interconnected to each other. The rapid etching at the surface takes place along with the inhibitor effect. The decomposition may be there at the surface so that it undergoes rearrangement and redistribution phenomenon.

When there was decrease in the efficiency due to inhibitor action, the adsorption causes the surface to tend to the roughness of the surface. It was noted at increase in temperature of the solution. The large area was exposed to the corrosion process causing deterioration due to acid medium. Also as the temperature was increased to high value (303 \(^0\)K), the rate of corrosion was also increased. The correlation between thermodynamic parameters and corrosion parameters was established by them. This was confirmed and characterized by using the scanning electron microscopic micrographs. The images before corrosion and after corrosion, also before inhibitor effect and after the effect were analyzed.
The image of corroded and aged showed the degradation of the samples at different temperatures as well as at different concentrations. The grain boundary effect was due to the acid medium. The greater susceptibility is observed for such samples. There was also inter-metallic precipitation which may be responsible for the large rate of corrosion.

They had reported their conclusions collectively because of the large data observed as follows.

1. In the temperature medium the efficiency goes on decreasing with increase in temperature.
2. The corrosion rate can be increased by using the DAMTSC inhibitor.
3. The efficiency of inhibition increases gradually with the increase in concentration.
4. The Langmuir’s law is obeyed and the model of adsorption isotherm is useful for explain the corrosion phenomenon.
5. SEM images showed that we have protective film at the surface due to the inhibitor used.
6. The results were in good agreement for the either methods or techniques used by them viz. EIS and Polarization technique.

The review of research papers have been published by the Mudgal et al. (2010). It had been reported that there are various elements or metals which act as inhibitor and are toxic in nature. Their property is related to the particular organism and the environment. If there is intake of the metal ions, then the effect is found to be manifold. We should consider the basic nature of particular metal ion. The tendencies to affect the other ion have been found to be dangerous in concern with the bacterial activity study. The bio-chemical mechanisms happening the in the living organisms have been analyzed by many researchers and their groups. When we consider the actual effect of the metal ion, it is a matter of concern. The toxicity is of prime concern of the research. The excess amount present in the liquid may be soluble or not but its presence causes the chemical reaction.

The toxicity of the metals is also related to the plants and animals the he various effects were explained by them in which the destruction of the plants and their species have been accounted for different regions. Many plants and animals absorb the ions of toxicity in large way. The synthesis of proteins in concern with the metal ions showed that the vitamins in it are
destroyed. In plants cells, the study showed the changes in their leaf structure cells. The cells movement will be slowed down along with liquid content in it. The pathological events were located at different places. The oxidative damage was resulted due to the inflammatory action of chrins diseases and deposition of the iron oxides. There may be the possibility of neurological effect, particularly the depositions on the cells. The ingestion of toxic metals had been found to be more dangerous than the premature intake. The contaminations of food and cold drink have been considered to be serious problem. When metals such as chromium or copper are present in any liquid environment the contamination was affected and spread in the food material in the form of ions. As the degradation proceeds further, the ions of metal are mixed in corroded form. This can cause diseases and body cells are to found to decrease initially slowly and afterwards very fast speed.

It was found to have preventive measures to be taken for avoiding or for destroying the cause. Once the metal ions get injected in the body, it becomes very difficult to destroy it. But we can reduce its slide effects by using some antibiotics. The different ranges of antibiotics are available today. Some of them may cause the reaction. In case of plants and animals, there are different ways to control the toxic activity. The metal ions of zinc and nickel, if exceeded, then there will be effect on then cells of animals as well as plants.

The research related within the sea foods and breast milk is limited to some constrains. The potential risk found by them was very high fir such research problems. They have reported that the health risk problems associated with chemical pollutants should be considered when we encounter it thoroughly. The heavy metals ions study done by them constitutes high THQ values. Once we select the value concerned with THQ value then it is possible to study the health hazards associated with the metal ions and its indigestion or at least the intake. The disruption of tissue members was observed to be having abrupt change. They have multiple pathways for the bio-molecules and proteins disruptor. The membrane potentials developed were changing in the proportionate manner.

In their article, the toxicity concerned with the causes, health related problems and the sources had been explained as the new origin for the research. The developments of the toxic metals and the characteristic properties were interconnected. The toxic chemical compositions are also formed by the presence of ions of toxic metals. The solubility index and the concentrations of it were found to be correlation.
They have concluded their results in the following way.

1. During the deficiency of vitamins and minerals, human body absorbs heavy metal ions with large speed.

2. The breaking of membrane took place due to the presence of different metal ions viz. Hg, Iron and zinc.

3. The toxicity rate is high for some liquids and high separation of ions factor concerned with the particular metal ion.

4. The solubility factor affects the rate of transfer.

5. The principle source of toxic metals is food. Other resources are drinks of all types and environmental causes.

6. The bio-chemical rule developed controls the bio-molecules movement or ion of metal under consideration.

7. The allergy is not caused by the toxicity of metal ions always.

The investigations were carried out to modify the surface properties of the H13 tool steel. The laser used was carbon dioxide laser. This laser was selected due to its advantage of high power and energy along with 10.6 um wavelength. The very interesting variation in this research was the spot size. They selected three sizes of the spots of lasers with diameters ranging from .09 to .4 cm. the other parameters varied were peak power and repetition frequency. The pressure o the order of 1MPa was kept constant. The samples were treated for initial conditions of preparation such as the rough etch processing of the surface. The different parameters changing were carried out to for the improvement absorption coefficient [Aqida, 2011].

The metallographic investigations were done for the benefit of the results. The X-ray spectroscopies along with the scanning electron microscopy were used for the study of characterization. The XRD observations were carried to determine the crystallographic nature. The measurement of the profile of the surface was carried using stylus profilometry. This is a separate measuring system for the characterization of samples in the metallurgy and mechanical engineering research. The different parameter measurement can be determined by such measurement. The change in phase was also determined by them in tabular results. It was found that the hardness property of the metal changes due to laser energy effect. The micro Vickers
diamond indentation was linked with the observations. They further changed the thickness and roughness having values 150 nm and 2.3 µm respectively.

They found that laser energy required to melt the surface from initial value was different than the final consideration. They set up a definite relationship between the hardness and thickness developed or created during the process. The heating and cooling rates were changed for the different diameters of the spots of the lasers. The large amount of energy of the laser could be changing the behavior of the surface in a larger way.

It was investigated that the parameters related with surface changes were drastically changed. The depth of the modified surface was very high at larger laser energies. If we decrease the size of the spot, a definite depth up to 1.1mm can be obtained in thicker samples. The controllable factor was the size of sample along with size of the spot. At a definite point a molten pool will be developed. The specific surface was observed at smaller surface sizes. In case for H13 tool steel specimens, the irradiated laser doses produce the roughness but at the same time the hardness. The metallographic study was performed to determine the grain size and composition of the surface. The changed morphology constitutes different grain size variation with change in the spot size. In case of DOE3, DOE4, and DOE5, the observations of absorptance of the surface were varied with the dose rate. The graphical representations showed the different characteristics of the specimen at 245 °C temperature.

The overlapped pulses design and surface absorptance design developed in DOE3, DOE4 and DOE5 successfully produced a uniform modified surface with enhanced surface properties. There was very much positive result for M23C6 and M7C3. The martensite phase at grain boundary changes at low values of surface depths.

The surface modified properties were enhanced up to three times that of the unmodified specimen. The Hall-Petch relation was found to applicable to such a problem. The hardness measured was found to be 243 HV .1 and 700 HV .1. These properties can be used for developing specific engineering applications.

The changes on EDXs values showed change in the composition at the modified surface for the DOE2 and DOE5 specimens. The changes in composition were due to the pulse energy and the cooling rates. The XRD study showed that there was alpha Fe crystalline decrease due to the size variation of the laser spot.
The concept of thermal cooling affected the roughness and grain size factors in larger way. As the cooling rate changes, the micro-structural changes are affected. The hardness will be key parameter for this cooling variation. The heating and sudden cooling makes the material very hard than the initial one.

The conclusions drawn were reported as follows.

1. The roughness of the H13 tool steel can be achieved up to specific depth by laser irradiation process.
2. The different sizes of the lasers have significant effect on the grain size.
3. The decrease in size of the spot causes the depth of spot variation.
4. For specific cooling rate the, surface roughness increases with the decrease in temperature.

The surface and micro-structural properties of magnesium and its alloys had been studied by using various techniques. These materials have number of applications in the medical industry and electronics industry. In the earlier days, magnesium has been used in the automotive industry in large way. The properties of such metal are found to be suitable and are better than aluminum and steel in concern with applications of using the same metal. Its density is low and strength is very high if we compare it aluminum, particular to weight ratio. Inspite of advantages, there is great threat imposed by the stress cracking and porosity after application. Even when the solidification takes place, the porous layer formation results. During the welding process, these defects were found to create serious problems. Due to such reasons, the study of corrosion related parameters had been done by the researchers [Izumi et al., 2007]. In their experimentation, the material selected constitutes magnesium and its alloys along with, silver nano particles paste. The coating was done by using organic solvent on very thinner sheet of AZ31B. The temperature was kept constant for certain time in one of the experimentation. The innovative welding procedure was carried out by using Nd: YAG laser. For this purpose argon was placed in the closed box.

For drying purpose, a sheet was placed on the jig. The welding of the lap type had been utilized. The microstructure study of the some characteristics and the behavior changes in the corrosion were carried out for the welding joints. The research concerned was characterized by using various techniques such as scanning electron microscopy and electron probe
microanalyses. The special points of consideration were analyzed by using energy dispersive spectroscopy and immersion; there was promotion of grain refinement due to the nano particles used.

They had reported their results successfully. The magnesium alloy could be welded by using the nano particle coating with special attention to the specific temperature. The rate of corrosion calculated for weld joint of AZ31B and coated by the silver particles was found to be reduced up to the satisfactory level. The aluminum content was very low they found that the alloy B-phase Mg 17 A 112 may cross the barrier of critical potential.

The corrosion can be surprised if the content is further increased. The AZ31 alloy formed have different characteristics than the original one due to the decrease in corrosion rate up to 44% at weld joints.

The solidification of the grains was found to be having great importance concern with stabilization and anodic current conditions. In the aqueous conditions, it was less soluble.

They had uncounted different reasons in concern with reduction in corrosion resistance. They found that the galvanic attack affects alloys. Also, the solidification observed was very rapid. The inter-metallic particle sizes were changed by forming non equilibrium phase change. The chemical impurity was found to be introduced in the results. The grain formation was also found to be less. The formation of insulating protecting layer was responsible for the reduction in galvanic as well as cracking corrosion. There were no stresses or the abrasions on the surface of the specimen. The contact corrosion was less compared with as received specimens. They have also proposed new methods of surface treatments. The large inhibition to the galvanic corrosion was found to be for the new specimens formed with protecting layers.

The different processes had been carried out by them for the improvement of corrosive properties such as coating, plating, welding, solidification etc. The anodization and laser melting played the important role in the processes. The method of corrosion and the oxidation had been utilized by many researchers for the study of corrosion related properties of magnesium and its alloys for the application purpose of AZ31 type.

The age hardening of magnesium alloys was observed at the certain temperature, particularly for the temperature of 100 °C. At very high temperatures, the microstructure damage was observed. The hydroxide film formation by solution of Mg (OH)₂, had affected the age hardening after immersing magnesium metal plates protected layer in the solution.
The thickness of micro layer measurement was carried out light scanning confocal microscopy. The evaluation of corroded surface was done using scanning electron microscopy. The thick layer was formed due to the combined effect of low speed scanning and low heat input laser. The fill form corrosion has been avoided after formation of magnesium oxide layer. When the decomposition of hydroxide layer takes place, the contact corrosion was greatly prevented by magnesium ions at the surface.

The laser power utilized was 11w which produces the heating effect and melts the surface or the surface layers formed. This was resulted into the new alloy formation. The thickly layer formation after certain period acts as hard layer which in turn causes to avoid fill form type corrosion. They had drawn following conclusions.

1. It is possible to avoid fillform corrosion by formation of magnesium oxide layer on the sample.
2. It is possible to change particle size and intermetallic phases could result in hardening of the specimens used.
3. Surfaces can be made soft by using laser surface melting.

Demaree et al. [2011] had investigated the effect of mixing of ion beam in the formation of amorphous and crystalline thin film of Fe-Cr-P. This type of alloys thin film was tested for the oxide formation anodic polarization behavior. The resistance for corrosion concern with the thin film and amorphous alloys were noted. They studied for such investigations, different historical research papers for the support. In case of glassy alloys, the effect of amorphous nature of the alloy and corrosion resistance associated with it was determined. This was studied for metal-metal or metal-metalloid systems using the beam mixing technique [Searson, 1990]. The alloys which were amorphous found to be very corrosive in nature. The film formed due to the passivity i.e. Fe-10-Cr- Xp in the acid solution was observed. The cause behind this was considered to be due the amorphous nature as well as non metallic nature. The technique of rapid quenching was used for the investigations. If amorphous alloys are produced by non equilibrium techniques then the improvement in the corrosion resistance could be achieved. In case of phosphorous implanted stainless steels the improved results of critical current density were obtained. The same results were observed for Fe-Cr alloys.
The uncertainty in the concentration of metalloids and its co-relation with the corrosion property was found to be the concern of interest. The implanted surface showed the drastic change in behavior and nature of corrosion. Instead of implantation, beam mixing technique was utilized for the benefit of corrosivity by avoiding drawbacks. The homogeneous nature of the alloy was studied for which chemistry and the structure was found to have a thickness of 60 mm. The thick film formed on the substrate could be tested for understanding the electrochemical nature.

Different characterization techniques were employed after the test of corrosion behavior study. The passivity of the film formed on the alloy was tested. The iron-chromium-phosphorous alloys were found to have less effect corrosion under the low temperature conditions.

They have prepared a film of 60 mm thick in different layers or called multilayer film. The Kr\(^+\) ions were incident on the samples in ion implantation process. It was observed almost the 25% of films were formed have improved property of amorphous characteristics. The remained fifteen percent was to both the phases. They heated (450\(^\circ\)C) the specimen for re-crystallization so as to obtain the amorphous phase. The polarization tests showed that the films formed for Fe-Cr-P alloys are more resistant than Fe-10 Cr. The resistance was very high along with re-crystallization. The more pronounced effect was found to dominate the surface roughness. Due to the amount of phosphorous content this increase was created. They characterized the specimens using the XPS and found that phosphorous is responsible for the passivation phenomena. The enrichment in chromium content was noted satisfactory. Conclusions drawn are as follows.

1. The non-equilibrium technique viz. IBM can be used for the surface modification of Fe-Cr-P alloys surface.
2. The re-crystallization is helpful for the improvement of corrosion resistance of amorphous alloys.
3. For occurring passivation, phosphorous content in the material plays important role.
4. The thick films formed for Fe 10 Cr are more resistant compared with Fe-Cr-P alloys using the same technique.

The investigations of Cottrell et al. [1992] showed that metal surfaces can be melted by using lasers. Their research was related to the Fe-Cr alloy preparation and its characteristics study in relation to corrosion. The different effects took place during melting and after melting
were studied by them. The property related with the electrochemical nature of the metals includes the resistance and current variation with the potential. When the breakdown of the passivating film takes place, the characteristic behavior was found to be normal. The laser energies incident on the surface are acquired by the metals ions to cross the barrier of potential. This will result to change the ion distribution and may result to form transition phase at few nanometers depth. The molten layer after cooling will have different properties. If these changed materials are subjected to the electric and chemical behavior, then we will have critical characteristics. These theoretical predictions were put forth by the research group associated with the Cottrell P. T. and Droper C.W.

They had selected iron and chromium alloy with the chromium percentage of 19 % of the total content. The electrodes associated with work were polished mechanically and machined. The preliminary procedure of cleaning the surface was simple. They had used the Q- switched laser having the wavelength of 1.06 µm. The pulse length was 150 ns. The power density was of the order of 100 mw / cm$^2$. They have used the spot size diameter ranging between 12 to 20 µm. These types of lasers were incident on the surface of alloy. The thickness was measured by thermal model calculations. The repetition rate was considered to be important. The sulfuric acid of 1 N and high grade was utilized for the behavior of the metal study.

The instrumentation involved was potentiostat, electronic auto recorder and electronic regulated power supply. The surfaces were observed by using SEM and AES techniques. These techniques showed the morphological changes happened after LSM effect for pit corrosion and the breakdown point’s changes. Thin film analyzer was used for the examining the physical changes. The high vacuum was maintained throughout the process and experimentation. The composition of the oxide before and after was examined. When different dose rates of lasers were incident on the alloy surface, they found that the Cr content involved in the alloy appeared to be on the surface. Most of the ions of chromium were related to the surface because of the melting temperature difference of Fe and Cr.

The rate of melting is different for different metals and the absorption of energy takes place different times. This effect was due to the LSM only. The AES spectra show redistribution of oxide layer and Cr ions. The depth profile variation showed that the air-oxide firm formation results at the transition. Thus in order to make the surface richer in chromium ions we should
modify it by using LSM technique. The iron to chromium intensity ratio was determined for various values of dose rates. The conductivity of molten alloy formed was found to be decreased due to the oxide formation. When there was change from passive to active potential, the reduction in passive resistance took place. Due to the excessive heating of the surface, the in homogeneity in alloy was resulted. The excess heating further resulted to forms pits with higher depth. So they had controlled the energy electronically. The pits observed were of non crystallographic types. At higher power of laser energy, the stress corrosion resulted. This was observed by means of SEM. The nucleation at ridges along with premature film breakdown was observed. Even for lower energies, the stresses were observed as like the stresses produced before LSM and due to the mechanical polishing effect. When the electro-chemical observations were carried out in the sulfuric acid, the I-V graphs showed changes in active as well as passive region characteristics. As per their observations and results, conclusions can be summarized as follows.

1. The phenomena of LSM improved the corrosion resistance but the pit nucleation will be predominant at the molten region.
2. The modification of surface takes place at certain potentials and powers. But it felt to them to consider the repetition rate and time of incidence.
3. The concentration of Cr ions at the surface went on increasing with power of laser.
4. At higher temperature the stress corrosion took place.
5. The roughness of the newly formed alloy surface was observed along with the pit formation having measurable depth.

Yan et al. [2012] had put forth their observations and results on antibacterial activities. They had selected silver as well as gold nano-particles for observing the effect on the Escherichia coli along with B. C. G. In the initial study, the effect of tuberculosis disease was enlisted for understanding the causes, impact as well as effect. We already are familiar with T. B. effects on the human concern. Particularly the health of human is always affected by such diseases. The vaccine used for the TB disease is famous i.e. Bacilus Calmette Guerin particularly for the bivine tuberculosis, it is widely applicable. It has been prepared by using muca-bacterium bovis bacteria. In development of the drug, the B. C. G. was found to be acting as surrogate. If it is cultured in the potato medium, then the virulence of B.C.G. may not remain in existence.
That’s why, the necessity of the combinational drugs preparation was found to be necessary against the diseases like T.B. The old therapy i.e. mo-therapy had been found to have failures. The infections in such cases become resistive against control. The nano-particles have much importance in the development of multiple drug resistant tuberculosis disease. The potential antibacterial drug was found to be the main subject of the investigation [Sondi et al. 2004] [Hsiao et al. 2006].

There were interactions between the bacteria of TB and nano-particles. Also the interaction can took place between TB bacteria and bio-sorption. The membrane damage and other effects had been put forth [Priester et al. 2009]. The toxicity was also the major concern of study. The antibacterial level was affected by the nano-particles of silver.

The antibacterial levels were affected by the size of nano-particles. The surface modification was another cause. The disease treatment can be accomplished by antibacterial mechanism. The antibacterial agent such as silver in the colloidal form was used. For safety purpose silver targets had been prepared. For such environments, the development of bacteria stopped. The medical equipments coatings are formed by using silver in different forms. The dental resins always contain silver in the fine form to form the paste. The silver nano particles weaken DNA replication. They also inactivate proteins. Thus antibacterial property of silver is familiar since ancient Greece civilization. The gold is very less toxic than any other metal, particularly silver.

The effects of antibacterial substances and chemicals had been studied by many investigators. The different NP’s were compared with E. coli. They were found to be having spherical shape. The CFU procedure was utilized for the evaluation. The mechanism behind the antibacterial property, TEM and SEM analyses were performed. The action of NP’s was related with bacterial action. The interaction involved was observed by keeping various parameters at specific value. The numbers of BCG cells were measured with the level of fluorescence. In the study of the anti-TB drug, it was the NP’s (Nano-Particles) action on bacteria.

They had put forth following conclusions as follows.

1. There was the dependency of nano-particles on the surface modifications and compositions.

2. Nano-Particles of silver and gold are potentially strong to act as anti-TB compounds.
3. Both, gold and silver are not much toxic. Gold may not be considered to be toxic.

4. There was co-relation between BCG cells and fluorescence.

The electrochemical corrosion of AISI SS 304 has been studied [Larijani et al., 2007]. The deposition of ZrN films were deposited on the samples of stainless steel 304 type. The technique used was ion beam sputtering technique. They varied the rate of flow of nitrogen having mixture of argon and nitrogen gases. In order to study the corrosion behavior, the potentiodynamic polarization test was carried out. The solution used was 0.5 N H₂SO₄ The effect of nitrogen flow rate variation on the stainless steel was observed. The characterization of the samples was done using X-ray diffraction (XRD). The film texture coefficients were determined for different samples and the flow rate.

There are very numerous applications, which are also interesting corresponding some deposited alloys. Particularly the metals deposited by ZrN films are used in the cutting tool industry. These coatings were found to be behaving as hard wear resistant coatings. They have golden color due to which they offer applications in jewelers industry. The tremendous scope now a day possessed by them. They are found to have substantial corrosion resistance. In order to improve either resistance of corrosion in various environments, they had selected such problem having novel applications.

The films of ZrN on the metals, thermal and electrical characteristics are generally dependent on the different techniques and manufacturing methods. They had reported that there had many defects for PWD techniques such as deterioration of the corrosive protection and the porosity. These affect the performance of the samples under consideration.

In their observations, it was shown that for the higher texture coefficients causes the increase in the corrosion resistance of the protecting layers. The connection between the closed packed structure and lowest energy was observed. These gave the high stability in concern with chemical and mechanical properties. In their characterization using the scanning electron micrograph investigations, it had been explained that the ZrN can offer anticorrosive property. This may be due to the higher texture coefficients (111), and better film thickness. The effect of the ratio N₂/N₂+Ar with the function F (N₂) on the corrosion parameters, particularly, resistance and microstructure were systematically pointed. The ion beams of nitrogen were implanted on
the film of ZrN. There were no sputtering effects by which loss of the material to be deposited increases the efficiency as well as the uniform change in the surface structure was possible to obtain.

The thickness of film was observed to be decreased in the sulfuric acid. The concentration of the acid was also varied. At different concentrations the resistance offered for corrosion was changed. The surface morphology showed the films on the surface changed crystalline orientation. The XRD analysis confirmed the results by showing increased orientation (111). The change was from (220) axis at low F (N$_2$) to the (111) axis at low F (N$_2$). The surface damage was observed due to the attack of the medium of corrosion. As the film thickness goes on increasing, the corrosion goes on deceasing. The nitride film avoids damages. All the conclusions drawn were listed as follows.

1. The IBM technique used is advantageous than the conventional technique of film deposition.
2. There was no any sputtering effect and hence the efficiency increase is possible. The rate of corrosion increases with decrease of the nitride film (ZrN).
3. The orientation was found to be increased (111).
4. The crystalline orientation was changed by the change in surface morphology of the stainless steel (SS) type 304.
5. The uniform distribution of the film thickness increases the corrosion resistance of the material.

Marvelous researches have been done by a research group [Yokota et al., 2001]. They had formed the superior stainless steel which was observed to be having superior corrosion and antibacterial properties. The durability the material was also superior. The surface of the samples of steel was modified. The polishing of the surface at initial sample preparation was performed. The steel selected was of having austenite (10-35% of wt of carbon). The martensite as in the proportion 10 to 19% of weight of carbon along with the ferrite 10 to 50% by weight of Cr was mixed. These compositions were mixed to form a new type of steel. The important feature of their research was the preparation of samples themselves in the laboratory. During the samples, the different processes were utilized. The silver was also mixed for small amount for observing the antibacterial property results study. The corrosion resistance and antibacterial activity was
co-related by them. The steel content thus have silver atoms in the body itself. The surface exposed to the solution resists microorganisms as well as resists the corrosive environment. The steel already consists of chromium content which was found to be responsible for the higher corrosion resistance. They varied the chromium content in the samples and observed the effect. The sample thus termed was annealed cold rolled steel. They had put forth following results and their conclusions’.

1. The corrosive properties of this new steel type was found to have better results compared with other steel types. The two fold increase in corrosion can be observed.
2. The antibacterial activity of this steel very good. This was due to the silver content present at the surface of the metal.
3. Chromium content improves not only resistance to the corrosion but also antibacterial activity.
4. The *E. coli* percentage was found to be reduced to almost greater than 99%. This was the great achievement done by them.
5. The antibacterial property was sustained regardless surface finish of the steel samples used. The polishing slightly affected the property of killing the *E. coli*.
6. The composition of martensite and austenite changed the properties of the samples in a dramatic manner. If both are separately considered in the steel types then the results found were different than this type of steel.

The methods for the study of antimicrobial effect are disc diffusion and broth dilution. Amirulhusni et al. [2012] had put forth his study related with antimicrobial effect of silver nano particles against *P. aeruginosa*. These are multi resistant bacteria and harmful to human being. The size of nano-particles was varied from 20 nm to 30 nm. They used colloidal silver and were kept on the grid of copper. The scanning electron microscope was used for analyzing effects. The strains used for comparison were *imipenem* (IPM), *ceftazidime* (CAZ), *cefooperazone* (CFP), and *gentamicin* (GM). They were compared with antibiotics ciprofloxacin and the *P. aeruginosa* was used as a control. They modified the usual method of agar disk diffusion method for evaluation of antimicrobial activity. A gram negative bacterium viz. *P. Aerruginosa* is very harmful and can cause serious problems. Due to its resistant activity, antibiotics are not much useful to the protection. It is highly motile in nature in immune comprised patients. These bacteria affect the
urinary tract and cause the infection. Its characteristics can be changed by keeping them in contact with some other bacteria. We know that the silver is having antibacterial activity. In newborns there was anthrax effect. In the study the properties of nano-particles were applied to such problems, and then it is possible to evaluate the antibacterial activity.

It is a common experience that the whenever there is small particle, the surface area will be more and the interactions involved are better. The data related with antibacterial properties of antibiotics is available anywhere. The E. coli and Saffilicoccus aureus are studied for knowing their effects at different places. The silver nano-particles can destroy the bacteria up to some level. The susceptibility test was modified. On the MH agar plate, they placed different colonies of bacteria. For the positive as well as the negative control, small amount of (20 µg) gentamicin was taken. All the plates were placed for incubation and observations were noted.

The incubation was carried out for 18-24 hours successively and the temperature maintained was 37 °C. The inhibition zone diameters were noted. The average inhibitory zone diameters were also determined. The results for MDR strains were approximately similar to the susceptible strains. The large inhibition zone for gentamicin was observed. The reduction in the diameters for inhibition zones related with MDR showed susceptibility characteristics. But in case of silver nano-particles diameter was very large compared with control. The study listed the conclusions as follows:

1. The silver nano-particles showed significant effects on _P. aeruginosa_ bacteria and the changes happened were having accountability.
2. In intensive care units the susceptibility will be pronounced for _P. seudomonas aeruginosa_.
3. It is necessary to modify the conventional method of studying antimicrobial activity for some bacteria.

The different types of complexes M (III) were synthesized by a research group [Kumar G. et al., 2010]. These complexes were of iron, manganese and chromium. The Schiff base was derived from 2 amino 4 ethyls 5 hydroxy-benzaldehyde and thio-carbo-hydrazide. In order to characterize, they used different techniques such as magnetic measurements, IR spectral studies and elemental analysis i.e. C, H, N. etc. A special type of geometry was proposed by them for all complexes as five coordinated square pyramidal geometry. The antimicrobial activities against
E. coli, P. aeruginosa, B. megaterium and fungi tricho-dermareesei, rhodotorularubra etc. were studied. They correlated the geometry of complexes with the antimicrobial activity. Pathogens were found to be more active than these complexes. It was observed that the best activity could be related to chromium III complex. Another effect observed by them was that legend is more active against fungi *T. reesi*.

The agar diffusion method was used for the evaluation of antibacterial and antifungal activity for the different synthesized compounds. The zone of growth of inhibition was measured against the organisms under the test. The comparison was made between activities related with antibacterial and antifungal values of the legend and its complexes of legend with those of standard drugs. The standard drugs such as ciprofloxacin and griseo-fulvin were used. It was observed that the variation in activities depends on the metal complexes against different microorganisms. It depends on impermeability of the cell or differences in the microbial cells. The lipo-solubility associated with lipid membrane was in consistent to the metal complex percentage.

The antibacterial and antifungal activities of the synthesized compounds were evaluated by the agar diffusion method. The antimicrobial activity of all the synthesized compounds was evaluated by measuring the zone of growth inhibition against the test organisms with zone.

The antimicrobial activity was controlled by the lipo-solubility. The lipid membrane had been found to be decreased. It never blocked or inhibited the microorganism growth.

The observations clearly revealed that the legend could exhibit antimicrobial activity against *K. fragilis* and *T. reesei*. There was no activity against *R. rubra*. The very high activity was observed for the chromium III complex than other complexes against *K. fragilis*, and *B. megaterium* as well as for *R. rubra* and *C. albicans*.

The activity exhibited by the manganese was moderate against *P. aeruginosa* and *B. megaterium*. Similarly in case of iron complexes the activity was also moderate. The related bacteria were *S. aureus* and *T. ressei*. The effect was found to be higher than for the *E. coli*.

The conclusions drawn were as follows.

1. It was concluded that there exists mononuclear structure for the complexes [M (C19H24N6O2S) X] X2.
2. There was co-relation between the square pyramidal geometry and electronic spectral data.
3. It was observed that all the complexes show less activity for E. coli, S. aerreus. And *P. aeruginosa*.

4. There is best activity for chromium III complexes for *B. megaterium* as well as the all fungi.

Koizhaiganova et al. [2011] had studied the effect of colloidal silver particles on the antimicrobial activity. The MIC value was determined for testing different bacteria. The microorganisms considered were *E. coli, C. albicans, B. subtiluis, s. typhimrium, S. Auer,* and *K. pneumonium*. The minimum inhibitory concentration value (MIC Value) was determined for colloidal solution resistance. The method used was the broth micro-dilution method. The solgel method was used for the preparation of colloidal solution of silver nano-particles in specific concentration. The different parameters such as viscosity, pH and turbidity were measured. The atomic force microscopy had been used for the measurement of the diameter of nano-particles. The growth inhibition was studied for all the microbial. For the microorganisms and the fungus *C. allbicans* the growth inhibition results showed improvements. It was observed that the method utilized was superior for the determination of bacterial effects associated with the silver nano-particles. The good homogeneity and control on composition was observed. In order to obtain thin oxide layers, it was found to be better to consider the compositions of solutions and the processing temperature. Sol gel method produces transparent layers on the substrates.

The growth inhibition associated with minimum concentration was the important factor of observation. At the concentration value from 2 to the 4 µg/ml of nano silver, the eradication of all bacteria was observed. There was complete inhibition growth. The *B. subtilis and E. coli* inhibited by the 3 µg/ml of nano silver solution. At the concentration value of 2 µg/ml of nano silver solution, the growth of *P. aeruginosa* was inhibited. Thus they observed that the inhibition efficiency can be increased for MIC value of 4 µg/ml of nano silver. The pronounced antibacterial property was linked with colloidal dispersions which were synthesized. The high activity observed was definitely liked with the advantage of sol gel method. It was shown and proved that very small nano-particles may be obtained for the changing the surface properties. The surface in contact with the solution inhibits the growth in a larger way. Over all conclusions were reported by them as follows.
1. Sol gel method is advantageous for the bacteria and fungus studied in these investigations.
2. The inhibition efficiency of growth increases according to the concentration changes and contents.
3. The MIC values are important for determination of antimicrobial parameters and activity.

The new novel nano-technology had been investigated by the Jiang et al., [2007]. The biomimetic polypeptide coatings of nano nature had been made on the metals by implantation. The cefazolin was stored in the polypeptide nano coating. The stainless steel discs were studied for different activities. The modified Kirby-Bauer method was used to find out activity of different microorganisms. The diameter of inhibition zones were measured for all type samples. The electrostatic self assembly as a novel technology was used for assessing the activity against various microorganisms. It was observed that the PLL or PL or GA multilayer nano-coating can be examined by UV spectrometry. They pointed out that the multilayer samples were not showing the activity. The stainless steel disc having multilayer coating and captured by cefazolin can show the activity against the bacteria S. aureus. The clear zone of inhibition was observed. The mean diameter was 22.4 mm. As per their study, antibiotic incorporated samples are showing the activity against the bacteria. The cefazolin though an act as the constituents in the process, the nano particle is the main cause. The infections associated with implants specimens had adverse effects. The additional benefits are offered by the colonization rates. They had concluded their results as follows.

1. We can modify surfaces by modified nano coating method i.e. electrostatic self assembly.
2. For S. aereus bacteria, the cefazolin shows the susceptible nature for the bacteria under consideration.
3. The discs prepared from the stainless steel do not show activity against bacteria but if coated by nano technology, then we can observe the activity for such specimens at different concentrations.
4. It was prime concern about the research that for prevention and control of dental and orthopedic implant infection, the modified method can play important role in the field of activity against bacteria.

Antimicrobial effects of gold are familiar to all. These precious metals spherical nanoparticles had been tested for its activity by preparing its spherical nano particles. The antifungal activity was observed and reported by coating it in the fluconazole [Zawrah et al., 2011]. This activity was determined against six bacteria. These bacteria develop in the food resulting into poison. This poisonous effect of the microorganisms was the main concern and its eradication was very important concern. Three fungal bacteria were also detected and its removal study was reported by this group of researchers. The agar disc diffusion method was used along with MIC. The synergic effect produced by gold particles against the drug for reference was used.

The characterization was done by using TEM and UV spectra. All the six bacteria and three fungi were firstly isolated before the observations. The inhibitory test associated with MIC was utilized for the observations. The standard drug used was ciprofloxacin for comparison purpose. The bacteria tested for analysis were A. Nigero, C. albicans and A. flavus.

The inhibitory zones diameters were found to be 14, 13 and 12 mm for niger, albicans and flavus. In case of L. cytones E. coli and P. aeruginosa the diameters reported were 13mm, 15 mm and 12 mm respectively. There were different MIC values for all the isolates. But the main concern was that gold nano particles were found to be showing high activity against all the bacteria and fungi under the test.

The results were suggestive to the observations. They indicated that the coated np’s have larger effect on the organism movement and removal. The displaced portion in the diffusion method also showed to be sensitiveness of the gold particles effect. The bacterial growth also found to be stopped during the observations. The treatment duration was also decreased.

The side effects of the drugs were found to be removable by using np’s coatings. The most hindrance effects were observed compared with effects of drugs. These particles were found to be more active against gram negative bacteria due to thin layer of peptidogly. All the conclusions were drawn as follows.

1. Gold nano particles posses’ antimicrobial property against six bacteria and three fungi associated with selected environment.
2. The bio-film formation takes place due to the thin coating of np’s.
3. The treatment time was found to be minimized.
4. It was made possible to decrease or minimize the side effects.
5. The variations in the inhibition zone diameters were observed.

The investigations had been carried out for the evaluation of resistance due to antibiotics and chromium tolerance along with potential related with antibiotics. The actinomycetes were found in the different soils and sediments. The effect of Cr (VI) on these isolates was the main concern of the study [Jain, 2012]. The strains were isolated from the marine sediments of the St. Martine Island in the Bangladesh. He had correlated resistance due to the antibiotics, production of antibiotics and chromium resistance. Actinomycetes are a group of microbes. This causes degradation as well as transformation of organic substitutes including metal substitutes. These bacteria are involved in the marine sediments for longer times.

The resistance of antibiotics for some isolates had been studied against 10 different types of antibiotics. The method used was disc diffusion method. The streak method was used to calculate the potential produced by the antibiotics. The screening for resistance for the Cr (VI) metal was done for the reduction activity. The reagent used was 1, 5-diphenyl carbazide.

The actinomycetes consist of some components which can grow microorganism in the specific environment. These also are responsible for the production or isolation of antibiotics. The metabolic diversity is important in connection with the results associated with organic matter. The importance of chromium is well known for living organisms. The chromium in oxidized form is toxic. It can generate carcigenic and teratogenic effects on human beings as well as plants. Cr (VI) is water soluble and has more mobility. It is absorbed easily and is not available on the mineral surfaces.

It is more mutagenic than the Cr (III) complex which is obtained from the Cr (VI) by the reduction mechanism. The compounds of chromium are always found to be mixed in the water either directly or through the soil. The vessels are plated by this metal. But the effect of chemicals, oils used for the food preparation and cleaning of vessel causes toxic effect. The environmental pollution is thus associated with this metal and its ions. The human health problems create major threat due to the utilization of vessels or the materials coated with this metal or compounds. The effects of activity against microbial was thus considered for the study.
The reduction of this metal was performed in presence some bacteria such as E. coli, Bacillus sp. etc. Many researchers had put forth the examination results.

The tolerance index observed for the Cr (VI) was, 2 for most of the isolates. Some of the isolates reduced the activity in a better way.

They have reported following major conclusions as follows.

1. There was correlation between antibiotic resistance and metal tolerance. The resistance went in increasing gradually.
2. Some isolates from 30 numbers showed the reduction in chromium content and concentration.
3. This metal can be used in bio-mediation approaches. It avoids the poisonous environment up to certain extent.
4. The toxic effect of chromium gets reduced by using actonomycetes content which is rich in isolates.
5. The soluble nature of chromium can be utilized for the applications in house hold articles for the reduction of bacterial culture effect.
6. The degradation due to actinomycets and the transformation can be avoided using Cr (VI) content.

The evaluation of the effect of copper, brass and silver against some bacteria such as E. coli, Shigella spp., Klebsiella spp. Etc was carried out. Various tests were carried out by preparing broth of the microorganisms. The contaminated water of Kathmandu was used for the study and analysis. All the procedures were followed for testing the activity and determination of the parameters. The ability of heavy metals and alloys which exert effect on the cells of organisms can be termed. This is generally called as oligodynamic action. It is already known that the silver and copper are active to the microorganisms.

They can destroy the bacteria and viruses. They can act as the antibacterial. The inhibition property of metals is already familiar in concern with activity. There is not necessarily the requirement of water to be pre for the use of industry purpose. Some metals are used as preservatives in food industry. During preservation, bacteria development is possible. At the same time different fungi may be produced due to the contact of food material and the container surface. These drawbacks were found to be necessarily being removed. For this purpose they have studied the problem in a different way. Very small amount of substances were selected.
When metals came in contact with each other, their ions denature proteins related with target cells. If ions are penetrating the cells then they will decay in little time. At this instant, the cumulative process takes place. It was observed that the silver forms the silver sulfide which is found to be dangerous for the cells to survive. In case of copper ions, the disruption of the cell membrane resulted. This resulted to stop enzyme activity. The silver ions were found to bind to DNA, RNA enzymes.

They found that both gram positive as well as negative bacteria were distorted by the oligodynamic action. The plasmines and traposons were found to be resistant. For gram negative bacteria, entric pathogens were activated in the drinking water. They had made a special study for making the pots of some metals to store the drinking water. The possibility of decontamination was tested.

The different parameters associated with silver ions and metal itself were determined in the study. The stability of the ion and the concentration was observed. The study revealed that the silver may be used as a preservative in the food industry. The amount of silver used was 10 to 100 times the less. This was their advantage of the study. In case of brass they had not shown any positive result. That’s why they paid much attention towards the copper and silver. The comparative study made by them also gave the concrete results for Cu and Ag metals. The bacteria isolated from the drinking water of Kathmandu valley were used for different tests.

It was shown that the copper acts as if having an antimicrobial activity for some bacteria. The organisms selected were S. enteric and C. jejuni. The activity was evaluated for copper by a research group [Gustavo et al., 2004]. The bacterial pathogens selected were responsible for production of food born diseases. The contamination of these bacteria takes place due to the poultry and the products related with poultry. The aim of the study was the evaluation of the property of copper against some bacteria and to find out the applicability of it in various fields. The study was also made to observe the possible causes of contamination of food and water. They selected varied counts ranging from 0 to 8 hours and temperature ranging from the 10 to 25°C. The comparison of the activity was done with that of the activity with the use of stainless steel and synthetic polymers. The better activity was noted for entero-pathogens than the activity with the control. They also reported that the there was no count effect even if we increase the time. In case of the meat, there was copper adsorption at the surface. This may get increased with time.
The conclusions drawn were as follows.

1. The silver and copper acts as inhabitants against the bacteria tested.
2. The use of Silver is advantageous than the copper for preservation purposes. But both have different application property.
3. The vessels for food preservation should be coated with silver to avoid contamination.
4. The amount required for the use was found to be very small i.e. 10 to 100 percent lower than the usual requirement.
5. Copper is possible to be used in water filters.

The importance of corrosion and corrosion avoiding methods is familiar to all. The investigation of new methods and its instrumentations design, fabrication and erection also is important. The applications of corrosion controlling elements for deposition are also a separate branch of research. All these factors require the study and knowledge of physics, engineering and technology.

If there is any investigation then its utility or application is also very important of concern. Many investigators have already linked the corrosion problem with biophysics or biotechnology but not in a specific manner. It necessitated proper combination of corrosion problem and the antimicrobial activity. The use of antibiotics, the methods of its study, the determination and evaluation of activity and then its utility was thought to be more advantageous concern. The difficulty level of literature availability was also the concerned subject.

All the reviews of the research work done by the various research groups and investigators related with our aim and problem selected shave been studied by me. The study of literature review clearly gave following conclusions.

1. The very few literature is available related with the study of corrosion behavior of maraging steel using ion implantation, ion beam mixing and laser irradiation technique.
2. The deposition of chromium on the specimens and the treatments on the specimens found to be not performed using the modern techniques.
3. Behavior of such Cr-deposited samples in the buffer solution and the polarization study was found to be not performed using these techniques.
4. The three sweep polarization method has not used for the behavior study of corrosion and its effects.

5. Also no one has put worth observations of antimicrobial study of maraging steel in the potable water of Manchar town.

6. Up till now, there is no any literature available related with applicability of maraging steels for water purifier systems or vessels used for the home storage of water for the drinking purpose.

7. The possibility of the utility of selected metal alloy in the medical, particularly for surgical instruments or materials field.

   Hence, we had selected this challenging problem and undertook such an investigation.