Original Article: Investigating the Behavior and Properties of Various Steels

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A B S T R A C T

Based on an old definition, steels are alloys of iron and carbon in which the amount of carbon varies up to 1.7% and elements such as manganese, silicon in amounts less than 1% and phosphorus and sulfur in small amounts as well as elements Like chromium, nickel and molybdenum exist as alloying elements. Having high strength and good flexibility distinguishes steels from other alloys and non-metallic materials, and steels are very resistant to variable actions and impacts. Their tensile strength varies from 400 to 2000. Simple carbon steels are steeling whose alloy percentage is very small. These types of steels have the highest amount of consumption in all types of steels. These steels are divided into three categories, which are explained in the next sheet. Due to the wide use of iron alloys such as cast iron and steel in the industry, we can understand the importance of this goal in human life. Iron, which is a very soft and flexible element in its pure form, is found in nature as iron ore, which is hard and brittle. The tendency of iron to combine with other elements, especially carbon, which has a great effect on its hardness, brittleness and brittleness.

Introduction

Based on an old definition, steel is an alloy of iron and carbon, the amount of carbon in which is variable up to 1.7%, and elements such as manganese, silicon in comparison less than 1%, and phosphorus and sulfur in small quantities as elements [1-3]. There are impurity and elements such as chromium, nickel, and molybdenum as alloy elements. High strength and good ductility distinguish steels from other alloys and non-metallic materials [4-6]. Steels are very resistant to variable actions and impacts, and on the other hand, it is possible to use them in temperatures below zero and temperatures of 700 degrees Celsius. Undoubtedly, among industrial metals and alloys, steels are the oldest family of these alloys. Their tensile strength varies from 400 to 2000.

Hypereutectoid steels

The amount of carbon in these alloys is between 0.8-0.25 percent. In this alloy, when the temperature reaches the transformation degree, the primary ferrite is separated from the austenite, and due to the lower solubility of ferrite for the carbon element [7-9], a further decrease in temperature while increasing the

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solid amount of ferrite causes the remaining austenite to be enriched with carbon [10-12]. This importance continues until reaching the temperature of eutectoid and austenite will be transformed. Due to the structure order of several alloys, the temperature will be lower than the eutectoid temperature of primary ferrites with a mixture of ferrite and eutectoid cementite called pearlite. In short, if we cool the hypoeutectoid steel, ferrite is deposited at the grain boundary of the ashite and it is the same everywhere [13-15].

Investigating the fields of tool steels

In these steels, there are layers of Fe3l and ferrite, which in total form a background of 100% pearlite, but these layers are compact in some places and spaced in some places. Are. Pearlite, which is hard and breaks the phase, does not allow operations and workability in these steels, and the production of parts with 0.8% carbon is done only through casting, which are used in the manufacture of parts such as cutting tools for metal oozing [16-18], transportation and Transportation, railways, rolling machines.

Cementite (iron carbide)

With the chemical formula Fe_3C, it has 6.67% of carbon. Cementite is relatively hard and brittle and is an intermediate compound. Its tensile strength is small and around 5000 PSI. Its compressive strength is high [19-21]. Its crystal structure is orthorhombic and it is the hardest phase that appears in the iron-carbon diagram.

Slow conversion of steel

An alloy that is a hypoeutectoid steel and has 20% carbon. In the stent region, this alloy contains a solid solution between the uniform layers. Each crystal grain has 20% dissolved carbon, which is placed in the empty space of the iron crystal lattice [22-25]. When this alloy is cooled very slowly, no changes are observed until the x1 point on the GJ line. The GJ line is called the high critical temperature line in the hypoeutectoid region and is denoted by A3. Allotropic change from F.C.C to B.C.C for pure iron occurs at a temperature of 910 degrees Celsius, but as it is clear from line A3, this temperature decreases with the increase of the amount of carbon in iron [26-28]. Therefore, at point x1 in the grain boundary of Stint, ferrite starts to appear. Since ferrite can dissolve a very small amount of carbon in itself. Therefore, in these areas, before changing the network to B.C.C, extra carbon must be removed from it.

The carbon that comes out of the solution dissolves in the remaining stints, so that as the ferrite continues to cool and increase, the remaining stint becomes richer in carbon and its carbon content moves down along the A3 line [29-31]. Finally, when the temperature of the alloy reaches the point x2 on the HJ line, the percentage of carbon composition in the stent reaches the point J. The HJ line is called the low critical temperature line in the hypoeutectoid region and is denoted by A1. A1 line is the eutectoid temperature line and it is the lowest temperature that iron can exist under equilibrium conditions as F.C.C [32-35].

At the moment when the temperature reaches the A1 line, the microscopic structure consists of approximately 25% sinter and 75% ferrite. The remaining stent, which is 25% of the total alloy, has 0.8% of carbon and undergoes eutectoid reaction. Note that in line A1 only Stint changes state [36-38]. Therefore, at the end of the reaction, approximately 25% pearlite and 75% ferrite will be observed in the microscopic structure. Now we will examine the eutectoid reaction in more detail. How does stint turn into ferrite?

As you know, Stint is a solution with an intermediate limit that has about 0.8% of carbon dissolved in F.C.C iron in the A1 line, while ferrite is B.C.C iron and has a smaller amount of carbon. Therefore, no change can occur in its crystal

structure, unless the carbon atoms are separated from the solution. Therefore, the first stage of the change in sedimentation is the deposition of carbon atoms in the form of iron carbide synesthete plates [39-41].

Then, due to the decrease in the amount of carbon in the adjacent areas of the cementite plates, iron atoms are placed together in the form of ferrite B.C.C, and thus thin layers of ferrite grow on both sides of the cementite plates. As the process continues, cementite and ferrite layers can be seen as fingerprints. This mixture is called polythene. The reaction usually starts at the border of cement grains and pearlite grows towards the inside of cement grains. During slow cooling to the x3 point on the CJ line, nothing happens in the alloy [42-45].

The CJ line is called the high critical temperature line in the hypotectoir region and is denoted by Acm. The Acm line shows the maximum amount of carbon that can be dissolved in Stint as a function of temperature. Above the Acm line, the stent reaches the saturation limit in terms of carbon content. As the temperature decreases, the maximum amount of carbon that can be dissolved in the stent is reduced and moves towards point j on the Acm line. Therefore, by reducing the temperature from x3 to x2, additional carbon is separated from the saturated solution of the stint and is deposited in the form of primary cementite along the grain boundaries [46-48].

Effect of other elements on steel

1- Sulfur: In industrial steels, the amount of sulfur is generally kept less than 0.05%. Sulfur combines with iron and forms iron sulfide FES. Iron sulphide forms with iron in the form of a eutectic alloy and is mostly concentrated in the grain boundaries, and when steel is forged or rolled at high temperature, it becomes brittle, which is known as hot brittleness [49-51]. Hot embrittlement occurs due to the melting of eutectic iron sulphide at the boundary of the grains and the reduction of adhesion of the grains and the formation of cracks. By adding manganese, sulfur tends to be removed, or it is distributed uniformly inside the steel structure as impure particles. For better results, it is recommended that the amount of manganese be 2 to 8 times that of sulfur. In well-cut steels, the amount of sulfur is increased by 0.08 to 0.35% to improve the machinability of the steel. The numerous impurities of sulphides cause brittleness and reduce tool wear [52-55].

2- Manganese: All plain carbon steels usually have 0.03 to 1% of manganese. Manganese reduces the negative effects of sulfur mentioned above. If the amount of manganese in the steel is more than the amount required for the formation of MNS, the additional manganese like iron combines with carbon and forms MN_3C, which is almost similar to iron carbide. Manganese also increases the quality of steel during the deoxidation process in steel casting.

3- Phosphorus: In steels, the amount of phosphorus is usually kept below 0.04%. This small amount is dissolved in ferrite and increases its strength and hardness. It seems that in some steels, the amount of 0.07 to 0.03 in phosphorus increases machinability. More phosphorus reduces the softness of steel and makes it brittle against cold work, which is called cold brittleness [56-58].

HYPOEUTOID steels

The amount of carbon in this alloy is between 0.0025-0.8 percent. In this alloy, when the temperature reaches the transformation degree of 723 degrees Celsius, the primary ferrite is separated from the austenite, which due to the lower solubility limit of ferrite for the carbon element [59], a further decrease in temperature while increasing the solid amount of ferrite causes the remaining austenite to Carbon is enriched. This importance continues until this

point, when the eutectoid temperature is reached, it will change. In this way, the structure of several alloys will be lower than the eutectoid temperature of primary ferrites with a mixture of ferrite and eutectoid cementite called pearlite. In short, if we cool the hypoeutectoid steel, ferrite is deposited at the border of the arrested grains and it is the same everywhere. Basically, steels are divided based on the amount of carbon they have, and based on this, they are used in making parts and accessories. This grouping is as follows.

1- Very soft steels: these steels have a maximum of 15% carbon and they are used in making chains and nails, rivets, wires and pins and steel strips.

2- Soft steels: these steels have between 0.3-0.15 percent carbon and the microscopic structure of the steels is mostly ferrite and a little pearlite.

Hypoeutectoid steels:

- ✓ When the amount of carbon is at most 0.1%, it is used in making construction steels, iron bars and rebars and special rods for reinforcing concrete and car parts, tin and white iron.
- ✓ When the amount of carbon is between 0.3-0.2%, this steel is used in making gears, levers, and forging.

Medium carbon steels: these steels have between 0.6-0.3 percent carbon and are divided into three categories. Ferrite and pearlite can be seen in the metallographic image of this steel.

- ✓ Steels that have a maximum of 0.4% carbon and are used in the manufacture of rods, connecting rods, shafts, wires, rods and steel plates, hooks and resistant pipes.
- ✓ Steels that have 0.4-0.5 percent of carbon and are used in making crankshafts, gears, shafts, holders, baskets, nets, and bicycle rings.
- ✓ Steels that have between 0.5-0.6 percent of carbon and are used in making locomotive wheels, rails and kitchen metals and wire ropes.

High carbon steels: these steels have between 0.6-0.9% carbon and are divided into three categories:

- ✓ Steels that have between 0.7-0.6% of carbon and are used in making anvils, gravity hammering and resistant screws, wrenches and screwdrivers, seamless pipe making and mandrels.
- ✓ Steels that have between 0.8-0.7 percent carbon and are used in making band saws and hammers, wrenches, springs, car bumpers, small forges and large molds for cold work, car body molds, etc. The metallographic image of these steels is mostly pearlite.

Tool steels: steels that have between 1.4-0.9 percent carbon. The metallographic picture of these steels is: pearlite, cementite, which are in the form of streaks on the border of pearlite, as it was said, the higher the percentage of carbon, the thicker the cementite streaks in the background.

- ✓ Steels that have between 0.9-1% carbon and are used in making springs and wires with high tensile strength, packages, knives, molds and mandrels.
- ✓ Steels that have between 1-1.1% of carbon and are used in making drills, milling cutters, knives, irons and irons.
- ✓ Steels that have between 2.1-1.1% carbon and are used in making bearings and drills and parts of lathes and wood cutting tools such as saws, graters, and lathe blades.

- ✓ Steels that have between 1.3-1.2% carbon and are used in making files and knives and lathe tools [58].
- ✓ Steels that have between 1.3-1.4 percent of carbon and are used in making cutting blades and are also used in machine parts that require wear resistance. It is clear that increasing the percentage of carbon increases the hardness and tensile strength of steel and decreases the flexibility of the metal, which is directly related to changes in its life span [59].

Definition of eutectoid and hypotactic transformation

If a solid turns into a second or third solid, this transformation is called eutectoid, but hypoeutectoid is called pre-eutectoid in which ferrite exceeds the solubility limit [60].

Conclusion

Steel is an alloy of iron, usually made with a few tenths of a percent of carbon to improve strength and impact resistance compared to other forms of iron. In the meantime, it is possible to use the combination of some elements in the steel structure. For example, stainless steels that are resistant to corrosion and oxidation usually require an additional 11% chromium. Chemically, iron metal can take two crystal forms depending on temperature and heat treatment. In this way, from the interaction of iron allotropes with alloy elements, primary carbon is transformed into steel. This change in the atomic arrangement of iron, in addition to changing the volume, brings about a change in physical and mechanical properties, which results in its improvement. In pure iron, the crystal structure has relatively little resistance against the sliding of iron atoms from each other. Therefore, it gives iron a more flexible property. In steel, small amounts of carbon and other elements combine with iron to form a stronger structure that prevents atoms from sliding. As mentioned, iron is the base metal of steel, and the difference between iron and steel is that the atomic structure of both is different. Because steel, having alloys, shows a different mechanical and physical behavior than iron. What is the composition of steel alloy? Steel is an alloy of iron and carbon that contains less than 2% carbon and 1% manganese and small amounts of silicon, phosphorus, sulfur and oxygen. For the production of steel, other alloys such as vanadium, chromium, titanium, nickel, molybdenum, tungsten or other metals may be used, each for specific purposes. What is the composition of cast iron alloy? Cast iron is an alloy of carbon and silicon that contains 2 to 5.3 percent of carbon and 0.5 to 3 percent of silicon and a small amount of manganese, phosphorus, and sulfur, which negatively affects its properties. The difference between steel and cast iron is the percentage of carbon in them, so that an iron alloy with up to 2% carbon is called steel and an alloy with 2 to 6% carbon is called cast iron. The carbon in the structure of cast iron is in the form of graphite, while the carbon in steel is in the form of iron in its structure. There are different ways to name steels. One of the most prominent of these methods is the naming of steel based on the DIN standard. The DIN standard, which belongs to Germany, is one of the leading standards in the field of metallurgy. The scope of this standard has expanded from primary products to final steel products.

References

[1] A Johnson, A Brous, A Samimi, Advanced Journal of Chemistry, Section B, **2022**, 124-134 [Crossref], [Google Scholar], [Publisher]

[2] A Johnson, A Brous, A Samimi, Progress in Chemical and Biochemical Res, **2022**,5 (2), 218-228 [Crossref], [Google Scholar], [Publisher]

[3] A Samimi, International Journal of Basic and Applied science, Indonesia, **2012**, 572-577 [Google Scholar], [Publisher]
[4] A Samimi, International Journal of Basic and Applied science, Indonesia, **2013**, 705-715 [Google Scholar], [Publisher]
[5] A Samimi, International Journal of Chemistry, **2013**, 01 [Crossref], [Google Scholar]
[6] A Samimi, M Samimi, Journal of Engineering in Industrial Research, **2021**, 2 (1), 1-6 [Crossref], [Google Scholar], [Publisher]
[7] A Samimi, S Dokhani, N Neshat, B Almasinia, M Setoudeh, International Journal of Advanced Scientific and Technical Research, **2012**, 465-473 [Google Scholar], [Publisher]
[8] A Samimi, S Zarinabadi, A Bozorgian, Journal of Chemical Reviews, **2020**, 2 (2), 122-129 [Crossref], [Google Scholar], [Publisher]
[9] A Shahbaz, et al., Bredigite-containing materials for regenerative medicine applications: A rapid review. Journal of Composites and Compounds. **2023** 5(16): 190-199 [Google Scholar], [Publisher], [Crossref]
[10] A. Ahmadpour, A. Bozorgian, A. Eslamimanesh, A.H. Mohammadi, Desalination Water Treat., **2022**, 249, 297-308. [Crossref], [Google Scholar]
[11] AA Esmaeilzadeh, F Nasirzadeh, Investigation of Chemicals on Breast Cancer. Eurasian Journal of Chemical, Medicinal and Petroleum Research., **2024** 1 (5), 51-75 [Google Scholar], [Publisher]
[12] AA Esmaeilzadeh, S Kordjazi, A Salari., A Short Review on the Use of Chemotherapy Drugs in Uterine Cancer., Eurasian Journal of Chemical, Medicinal and Petroleum Research., **2024** 1 (5), 87-96 [Google Scholar], [Publisher]
[13] E Yahaghi, et al., Helicobacter pylori in vegetables and salads: genotyping and antimicrobial resistance properties. BioMed Research International. **2014** 12;2014: 757941.[Google Scholar], [Publisher], [Crossref]
[14] ES Motaharian, et al., Radiologic findings of patients with covid-19-a systematic review study., Journal of Chemical Reviews., **2021** 3 (3): 171-180 [Google Scholar], [Publisher], [Crossref]
[15] F Al-Jabouri., et al., IL-18 Act as a Costimulus for Production of Interferon Gamma During Stimulation by Pseudomonas aeruginosa Infecfion, Pseudomonas aeruginosa Infecfion, J Pure Appl Microbiol; **2019**; 13(2): 891-896 [Google Scholar], [Publisher], [Crossref]
[16] F Divsalar et al. The Causes and Treatments of Neurological diseases: GB and MG in Children and Adults Involved Infection, relying on drug therapy and incidence of stroke and epilepsy., International Neurourology Journal. **2024** 28(1): 853-863 [Google Scholar], [Publisher], [Crossref]
[17] F Hosseinzadegan et al. Cardiovascular Diseases and Relationship with Mortality and Severe COVID-19 in Patients with COVID- 19: A Systematic Review and Meta-Analysis. International Journal of special education., **2022**.37(3); 12609-12617 [Google Scholar], [Publisher], [Crossref]
[18] F Mirakhori et al. Evaluation of Amyloid Plaques in the Nervous System of Alzheimer's Patients with Reference to Non-Pharmacological Treatments in Patients. International Neurourology Journal. **2024** 28(1): 804-820 [Google Scholar], [Publisher]
[19] F Mirakhori, M Moafi, M Milanifard, H Tahernia, Journal of Pharmaceutical Negative Results, **2022** 1889-1907 [Crossref], [Google Scholar], [Publisher]
[20] F Montazer et al. Histopathologic findings in COVID-19 Autopsies from IRAN: A comprehensive report of laboratory, chest Computed tomography (CT) and morphology findings. Authorea Preprints. **2020** [Google Scholar], [Publisher], [Crossref]
[21] F Rebout, A Samimi, Progress in Chemical and Biochemical Research, **2022**, 5 (2), 196-217 [Crossref], [Google Scholar], [Publisher]

[22] F Siadat, et al., The effects of periodontal treatment on pregnancy outcomes: A systematic review of clinical trial studies. Res Dent Sci. **2022**; 10;19(3):260-71 , [Google Scholar], [Publisher]

[23] FB AH Jalali,S Hassani, A Zare,T Ziaadini., Systematic investigation of cardio vascular & clinical problem in patients with covid-19 with Neurological and Pathological point, The seybold Report Journal, **2023**; 18 (04), 1634-1653 [Google Scholar], [Publisher]

[24] H Jafari, E Heidari, A Barabi, M Dashti Kheirabadi, Acta Metallurgica Sinica (English Letters), **2018**, 31, 561-574 [Crossref], [Google Scholar], [Publisher]

[25] H Kaseb Ghane, et al., High-Power Laser Application for Immediate Implant Placement in Infected Sites: A Systematic Review, Photo-biomodulation, Photomedicine, and Laser Surgery, **2024** 41, 12 [Google Scholar], [Publisher], [Crossref]

[26] H Zakeri,et al., Pain Management strategies in Intensive care unit:challenges and Best Practice, GMJ, **2024**;13: 3264: 1-8 [Google Scholar], [Publisher], [Crossref]

[27] JMM Sheibani Hossein., Pericarditis as a trigger for prinzmetal angina-a case report., Journal of medicine and life., **2021** 14 (6): 853 [Google Scholar], [Publisher], [Crossref]

[28] K Hadavand Mirzaei, et al., A systematic Review of medical care & investigation Rate of stroke in cancer fat patients with Bariatric and Radiological clinical points., International Neurourology Journal., **2024** [Google Scholar], [Publisher], [Crossref]

[29] K Hadavand Mirzaei, et al., A systematic Review Treatment and diagnosis of Neurological disease in fat patients with bariatric & Radiological points., International Neurourology Journal., **2024** [Google Scholar], [Publisher]

[30] K Hadavand Mirzaei, et al., Application of Robotic Instruments in Hip Arthroplasty Surgery Based on Practical Tips a Systematic Review, Eurasian Journal of Chemical, Medicinal and Petroleum Research, **2024**, 3 (2), 593-609 [Google Scholar], [Publisher], [Crossref]

[31] K Hadavand Mirzaei., et al. Medical care of infection patients undergoing weight loss surgery and laparascopy,relying on cardio-pulmonary & Neurological care: A systematic review., International Neurology Journal., **2024**; 28(2):74-83 [Google Scholar], [Publisher], [Crossref]

[32] K Hadavand Mizaei et al. A systematic review on the role of stem cells in the treatment and diagnosis of neurological diseases such as MS in overweighting patients with endoscopy point. International Neurourology Journal. **2024** 28(1) [Google Scholar], [Publisher], [Crossref]

[33] K Hadavand Mizaei et al. Application of Robotic Instruments in Hip Arthroplasty surgery based on practical Tips: A systematic Review.Eurasian journal of chemical, medical and petroleum Research. **2024** 3(2): 593-609 [Google Scholar], [Publisher], [Crossref]

[34] K Liu, et al., Preparation of Paclitaxel Nanocrystals Coated with Folic Acid-Modified Phospholipids Based on Preoperative Chemotherapy for Gastric Cancer. Journal of Biomedical Nanotechnology. **2024** 1;20(1):35-41. [Google Scholar], [Publisher], [Crossref]

[35] K Sohrabi et al. Determining the Role of Intestinal Microbiota Through Inflammatory Cytokines in the Occurrence of Constipation in the Elderly Referring to Hazrat Rasool Akram Hospital. International Neurourology Journal. **2024** 28(1): 563-575 [Google Scholar], [Publisher]

[36] Kh Ghasemi et al. Investigation of the prevalence of asymptomatic microscopic hematuria in primary school children of Bushehr and Kharg Island. Tebe Jonoob,**2004** 7(1): 54-60 [Google Scholar], [Publisher], [Crossref]

[37] KH Mirzaei., A Comprehensive Review of Bariatric Surgery and Laparoscopy Based on Surgical Tips., Globeedit, Europe., **2024** 1, 109 [Google Scholar], [Publisher]

[38] KH Mirzaei., Comprehensive Book of General and Bariatric Surgery with Regard to Surgical and Non-Surgical Points., Globeedit, Europe., **2024** 1, 141 [Google Scholar], [Publisher]

[39] L Khaji, MH Shahreza. SCCmec types in methicillin-resistant Staphylococcus aureus strains of various types of milk. Electronic Journal of Biology. **2016** 13:1. [Google Scholar], [Publisher]

[40] M Bayanak, S Zarinabadi, K Shahbazi, A Azimi, South African Journal of Chemical Engineering, **2020**, 34, 11-25 [Crossref], [Google Scholar], [Publisher]

[41] M Dashti et al.Application of Machine Learning in orthodontics: A Bibliometric. Advances in Artificial Intelligence and Machine Learning;**2023** 4(1):2014-2026

[42] M Jafari, KH Mirzaei, M Shojaei, M Saboury., A Systematic Review: The Relation Between Vitamin D and Short Chain Fatty Acid in Serum Plasma with Protein Recombination in VDR in Multiple Sclerosis Patients (MS)., Eurasian Journal of Chemical, Medicinal and Petroleum Research., **2024** 3 (3), 819-840 [Google Scholar], [Publisher]

[43] M Jafari, M Saboury, M Shojaei, KH Mirzaei., Methylation and Demethylation Gene Pathway Bio Chemistry Signaling in Fat and Athlete Adults with Point of Dopaminergic Points, Eurasian Journal of Chemical, Medicinal and Petroleum Research., **2024** 3 (3), 841-861 [Google Scholar], [Publisher]

[44] M Keyhanifard, et al., Systematic Examination of Neurological disease such as Guillian-barre and MG with Renal problem in cancer fat Patients with Radiological and clinical points., International Neurourology Journal., **2024** [Google Scholar], [Publisher]

[45] M Mohsenibeigzadeh, et al., Driving Innovation in Education: The Role of Transformational Leadership and Knowledge Sharing Strategies, Current Opinion, 2024, 3(4); 505-515[Google Scholar], [Publisher], [Crossref]

[46] M Naghdipour Mirsadeghi ,et al., Pain Perception at Birth depending on the Personality of the Parturient Women, **2022**, 7(6): 543-547 [Google Scholar], [Publisher], [Crossref]

[47] M Naghdipour, et al., The effect of pelvic floor muscle fatigue on stress urinary incontinence: A systematic review,**2021**, 24(7) [Google Scholar], [Publisher], [Crossref]

[48] M Nikpour, et al., Chinese Chemical Letters, **2010** 21 (4), 501-505 [Crossref], [Google Scholar], [Publisher]

[49] M Shojaei. A Systematic Review of the Effect and Safety of Alendronate on Bone Density in Patients with Chronic Kidney Disease. Eurasian Journal of Chemical, Medicinal and Petroleum Research. **2024** 3(2): 434-442 [Google Scholar], [Publisher], [Crossref]

[50] M Shojaei. Alternative Systematic Review of Insulin Resistance and the Role of Sex Steroids on Leptin Levels. Eurasian Journal of Chemical, Medicinal and Petroleum Research **2024** 3(1): 296-306 [Google Scholar], [Publisher], [Crossref]

[51] M Shojaei. CHAT-GPT and artificial intelligence in Medical Endocrine System and interventions. Eurasian Journal of Chemical, Medicinal and Petroleum Research., **2024** 3(1): 197-209[Google Scholar], [Publisher], [Crossref]

[52] M Shojaei. Leptin as a Surrogate Marker of Insulin Resistance. **2024** 1: 124 [Google Scholar], [Publisher]

[53] M Shojaei. The Effects of esreradiol on leptin and other factors. Eurasian Journal of Chemical, Medicinal and Petroleum Research., **2024** 3(1):131-141 [Google Scholar], [Publisher], [Crossref]

[54] M Shojaei., A Systematic Review of the Relationship Between Sex Hormones and Leptin and Insulin Resistance in Men., Eurasian Journal of Chemical, Medicinal and Petroleum Research., **2024** 3 (2), 443-453 [Google Scholar], [Publisher]

[55] M. Moqadam, M. Rahmani, Z. Karimi, A. Naderifar, Procedia Engineering, **2012**, 42, 34-44 [Crossref], [Google Scholar], [Publisher]
[56] N. Norouzi, A.G. Ebadi, A. Bozorgian, E. Vessally, S.J. Hoseyni, Iran. J. Chem. Chem. Eng., **2021**, 40, 1909-1930. [Google Scholar], [Publisher]
[57] S Asadimehr, Examining Drilling Problems and Practical Solutions Regarding them., Eurasian Journal of Chemical, Medicinal and Petroleum Research., **2024** 3 (2), 552-562 [Google Scholar], [Publisher]
[58] S Saedi, et al., Assessed the Complication of Central Nervous System in COVID-19 Patients: A Systematic Review and Meta-Analysis., Eurasian Journal of Science and Technology., **2021** 2: 185 [Google Scholar], [Publisher]
[59] S Saedi, et al., Epidemiological Study of Breast Cancer in Iran: A Micro Review Study., Eurasian Journal of Science and Technology., **2022** 2 (3):227-235 [Google Scholar], [Publisher], [Crossref]
[60] V Tajiknia, S Hassani, H Seifmanesh, A Afrasiabi, H Hosseinpour., Role of MRI in Pre-operative Assessment of patients with Advanced ovarian cancer candidate for cytoreductive surgery, A Brief Review., J. Obstetrics Gynecology and Reproductive Sciences., **2021**; 5 (9) [Google Scholar], [Publisher],