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RESEARCH ARTICLE

TO THE COMPATIBLE STUDY OF CLASSICAL AND QUANTUM PLASMA AND ITS APPLICATION

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ABSTRACT

At this paper we are intended to provide a brief primer in plasma physics, introducing common definitions, basic properties, and typical processes found in plasmas the present paper short discussion and compatible study about classical and quantum plasma and also discuss about the properties and application of plasma.

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INTRODUCTION

Plasma physics, in parallel to the other branches of physics, has been studying with its possible application successfully in various contexts. The word plasma is used to explain various types of macroscopically neutral substances are including plenty of free electron and ionizing atoms and molecules. They are reveal that the collective behavior of the large range coulomb forces. Not all the media including charging the particles and they can be classifying as plasmas for the bunches of charged and neutral particle to reveal behavior of plasma and its necessary to satisfying certain situation for the plasma. The word plasma comes from the Greek letter and its means modiable substance. Tanks and Langmuir was applied first in 1929, they are explain the inner region remote from boundaries. Electric discharge tube produced glowing ionizing gas that ionizing gas as a whole electrically neutral. The scientific community has already given a light saying that the plasma study will give a major break-through in technological applications. By now enough significant indication has already been found in plasma dynamics and showing a great importance in space and laboratory plasmas as well as in other astrophysical phenomena. The subject thus opens a reach field for research among the scientific community. For example, in the interiors of stars it happens due to the heating of matter to temperatures that are enormous on the scale of those available on the Earth.

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The ionization of planetary atmospheres or a gas in the vicinity of stars takes place under the action of ultraviolet emission of the sun or stars, respectively. Though the plasma temperature is low in these cases, recombination is a slow process in such rarefied plasma and thus ionization is maintained over a long period of time. The plasma envelopes of neutron stars consist not of electrons and ions, but of electrons and positrons that are the consequence of pair creation in extremely strong electric fields of rapidly rotating neutron stars (the rotation period ranging from few hundredths of a second to many hundreds of seconds and higher) with a magnetic field on the order of 10'10 to 1012 G.

Plasma as a fourth state of matter: Plasma is one of the fourth states of matter, the others are solid, liquid, and gas. Plasma has properties to different of the other states. Plasma made by heating of gases or applying it to a strongest electromagnetic field apply with a laser or microwave generator. They are decreases or increases of the number of electrons, created positive or negative charge particles called ions, and is followed by the dissociation of the molecular bonds, if present. The presence of number of charged carriers making plasma electrically conductive so that plasma responded strongest electromagnetic fields. Like gas, plasma doesn't have a definite shape and volume unless enclosed in a container. Unlike gas, under the influenced of the magnetic field, it's formed structures like filaments, beams and double layers.

Classical plasma: There are so many progress and growth has been made by the field of classical plasma used both kinetic and fluid models. These models are probably neglect in quantum plasma and also negligible for most of the applications. Dynamically behaviors' is analyzed in the classical plasma with there specific attention to the relation between individually particles and collective behavior. There are various ways to obtain an exact description of a classical plasma, for example the Klimontovich (Klimontovich, 1967) and the Liouville equation (Gibbs, 1902). Both these equations describe the evolution of every single particle's position and momentum, but a plasma typically consists of more than 10^{23} particles, resulting in a system with more than 10^{23} degrees of freedom. We have consider in the plasma, number of density n, composing the particles (electrons) with the mass m and electric charge e and they are interact with the coulomb forces we have to used all the above parameters and constructed a quantity that has a dimension of an inverse time it means plasma frequency.

Plasma frequency $\omega_p = \left(\frac{e^2 n}{m\varepsilon_0}\right)^{1/2}$

Where ω_p represent plasma frequency, n electron number density, m and e are mass and charge of electron, ε_0 is the permittivity. The classical plasma are collision less or weaked at high temperature and low density.

Quantum plasma: Quantum plasma is a relatively newest and advancing field of plasma research. The quantum effects may become important in a variety of environments when the plasma temperature is low and particle number density is high. The dispersion caused by strong density correlation due to quantum fluctuations can play important role on wave propagation in quantum plasma. In the past of few months there has been a great deal of interest to the exploration of numerous collective processes in quantum plasmas by using quantum hydrodynamic (QHD) equations that include the quantum statistical pressure and quantum forces involving tunnelling of degenerate plasma particles through the so-called Bohm potential . Because of simplicity and numerical efficiency, the QHD model has been widely used for studying wave propagation in quantum plasma. The exploration of privileges of quantum effects in semiconductor plasmas are requires latest mathematical model or empirical modifications to traditional plasma fluid model. An embracing model was prepared for quantum plasma, which is subsequently named as quantum hydrodynamic (QHD) model after the pioneering works of Manfredi and Hass (Manfredi, 2001). In QHD model, the quantum effects are precisely described by quantum diffraction and quantum statistics.

The quantum effects are alternatively interpreted as Bohm potential is represented by the terms proportional to ħ2, whereas the later effect, known as Fermi degenerate pressure, take into account the fermionic character of electrons. There are so many literatures have been reported where quantum corrections incorporating Bohm potential only, are valid for low-density of quantum plasma.

Applications: On the account of quantum plasma its potential applications in metal nanostructures, semiconductor devices, dense astrophysical environments, laser-solid interaction, cool vibes, small electronic device

- Nuclear fusion is the process of recombining nuclei to form different nuclei and released vast amount of energy
- Propulsion in space: plasma has also application in the propulsion of spacecraft.
- Neon signs are also made of plasma
- The glowing 'gas' in a fluorescent bulb is plasma
- Plasma globes are also used to make plasma in labs
- Plasma television.
- Plasma derives laser and particle accelerators.
- It's also used in making semiconductors.

Conclusion

In this paper we will present basic introduction of plasma and also explain how to plasma are formed. We will illustrate plasma as a fourth state of matter and lightly compatible short introduction of classical and quantum plasma. We will also discuss the possible applications of plasma. With the recent advances in quantum physics, the number of real world physical problems that quantum physics is being applied to have increased and Quantum plasma is a relatively newest and promptly progressive field of plasma research.

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