

MAGNETO-ELECTRIC HEXAFERRITE FILMS AND THEIR APPLICATIONS IN ELECTRICAL DEVICES

Magneto-electric Effect

Magneto electric effect may be described as the phenomenon of inducing electricity in the form of magnetic field through an external electric field. Ever since its discovery, electrical engineers set on their voyage of using the magneto-electric strategy along with different components and combinations.

Ferrite

Ferrite is a chemical compound that is basically ceramic in nature. The major component of this chemical compound is iron. Because it exists in different forms, soft and hard ferrites have been used distinctively for various purposes and reasons. They still continue to facilitate the course of human existence by being employed in abundant machineries, electrical devices and other general structures. Once properly refined, ferrites can also be called as 'ceramic magnets'.



Hexaferrite and its uses

Hexaferrite basically refers to a combination of materials in such a way that they possess remarkable magnetic properties and have a hexagonal symmetry. Thanks to the hard work and laborious yet productive researches of scientists and engineers across the globe, thin Hexaferrite films have been developed. These films are an integral component and serve a very important part in the successful functioning and performance of these machineries.

Research has indicated that minimizing the role of microwaves and magnetic devices, involves that they are integrated with semiconductors. This can only be achieved by depositing a thin film of Hexaferrite materials over them.

Ferrite cores have also been developed that ensure a steady and productive flow of current through devices that employ magneto-electric strategy. Following figure shows ferrite cores of different sizes that have been developed till yet. These cores are adjusted in electrical devices, keeping in view their size, work and requirement.



Applications in electrical devices

- Magneto-electric Hexaferrite films are widely used in transformers. It must be kept in mind that these transformers include both pole-mounted as well as tiny transformers involved in making of electrical devices such as our mobile phone chargers.
- Electromagnetic cores composed of nickel, manganese, iron etc. also consists of Hexaferrite thin films.
- Switch-mode power supplies are also among those electrical devices that employ the magneto-electric Hexaferrite thin films. One example of switch mode power supplies is a table supply available in laboratory.



- Hexaferrite thin films have excellent dielectric properties, thus the advantage of using them is low electricity loss and high power handling. Therefore, magneto-electric Hexaferrite materials are also being used in communication systems. Examples for this include the handsets used by military men over short distance.
- High-speed digital electronics i.e. mobiles and computers, transport radars, energy generation and microwave ovens also contain Hexaferrite films as their major component.
- Permanent magnets in the form of resonance isolators, filters, circulators and phase shifters employ the magneto-electric Hexaferrite technology.
- Gyromagnetic devices that include frequency selective power meters and power and frequency convertors are successful examples for the application of Hexaferrite films in electrical devices.

Problems associated with the use of Hexaferrite thin films

- As stated earlier, magnetic ferrites have been in use for a diverse range of communication purposes. But at times, the tuning of fields is a slow and expensive process. The process is noisy and also utilizes a lot of power for a successful operation.
- Temperature is a very important aspect to consider while dealing with devices that have Hexaferrite as their integral component. Research has revealed that Hexaferrite exhibits magneto-electric properties at room temperature. This may give rise to a problem in spaces that have relative drastic or frequent changes in temperature.

- Hexaferrite thin films are also an integral component for transformers located in the chargers of cell phones. These chargers are open to problem once mishandled or if they fall down with a strong intensity.

Solution to problems

- In response to the agitating tuning process, engineers and scientists have come up with a very successful technique. This strategy involves a technique known as voltage tuning, this technique is easy, yields successful results and is not irritating as the conventional mode of tuning.
- Concerns of customers associated with temperature are very valid. But a very easy and practical solution to this problem is firstly, to have a complete knowledge about those devices that consist of Hexaferrite thin films. Second, phase of solution is to consider only those spaces, vicinities and areas that have relatively stable room temperature.

Conclusion

Keeping in view, the diverse and widely used application of Hexaferrite thin films in electrical devices it won't be wrong to conclude that this discovery of electrical engineering domain encompasses almost all spheres of our life.

For people who are directly associated with the profession, there exists a never ending scope of development and research pertaining to Hexaferrite thin films.

Source : <http://engineering.electrical-equipment.org/electrical-distribution/magneto-electric-hexaferrite-films-and-their-applications-in-electrical-devices.html>