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Application of Optical and Magnetic (EOM) Materials in Material Science

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Introduction

Materials with novel and controlled electronic, optical, and magnetic properties have wide applications, including computers, lighting, detectors, drug, and sustainability. Research in electronic, optical, and magnetic materials includes processing techniques for obtaining materials with controlled compositions and structures, characterization, and applications of these materials.

Precise and correct measurements of the optical properties of materials square measure essential for the advancement of optical technology and their applications. Such measurements embrace reflection factor, transmission, emittance, absorption coefficient, and index of refraction.

Description

Optical materials are substances which are used to manipulate the inflow of light. This can include reflecting, absorbing, focusing or dividing an optical ray. The effectiveness of a specific material at each task is dynamically wavelength dependent, therefore a full understanding of the intercourse between light and matter is vital.

Magnetic materials are materials used substantially for their magnetic properties. A material is response to an applied magnetic field can be characterized as diamagnetic, paramagnetic, ferromagnetic or antiferromagnetic.

Characteristics of optical materials

Optical materials ate constantly depend upon the following properties such as homogeneity, stress birefringence, striae, luminescence, coefficient of thermal expansion.

Homogeneity is nothing but when a glass is manufactured, it's not only the percentage of specific constituents that are important to its final properties but also how well those constituents are mixed together.

One of the most important property of optical material is stress birefringence which means the effect reduced when an optic has a different indicator of refraction for light polarized resembling or perpendicular to the stress. It's also expressed in terms of OPD/nm (or) cm magnetic materials are basically divided into endless magnetic materials and soft magnetic materials. Permanent magnetic materials are also named hard magnetic materials. The magnet can retain its strong captivation for a long time after applying an external magnetic field, and it has the specific of High Coercivity (Hc). Soft magnetic materials are magnetic accoutrements that are easy to be magnetized and demagnetized after applying a magnetic field. It has the property of small coercivity with Hc ≤ 1000 A/m generally.

Magnetic properties of permanent magnetic materials

They're four important magnetic properties of paramagnet magnetic materials in which it includes:

- High maximum magnetic energy product the maximum magnetic energy product (BH) max is a measure of the maximum magnetic energy viscosity stored and available per unit volume of the endless magnet material.
- High Coercivity (Hc) is a dimension of the endless magnetism of permanent magnetic materials.
- High residual magnetic flux viscosity (Br) Residual magnetization (Mr) is a dimension of the strength of the magnetic field in the air gap.
- High stability the high stability of the external hindrance magnetic field, temperature, vibration and other environmental factors.

Conclusion

Optical materials deal against the exposure to electromagnetic radiations, especially to visible light. While utmost of the optical materials are generally regarded as linear media there response to light is in fact slightly non-linear and glass is the most favourable optical properties as glass has a historically most stable and scratch resistant and provides the best quality of all lens materials whereas electromagnets are authentically easy to make and they can be controlled. Electromagnets are useful the regular magnets and the work with electricity.

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Precise and proper measurements of the optical properties of materials area unit essential for the advancement of optical technology and their applications. Such measurements embrace coefficient, transmission, emittance, absorptance, and index of refraction. Inorganic nonlinear optical material is one in all the key branches of materials science that has attracted abundant attention as necessary nonlinear media. during this chapter, the foremost wide used and new developed inorganic nonlinear optical materials in infrared, near infrared to visible, ultraviolet and deep ultraviolet spectral ranges square measure delineate, together with their structures, linear and nonlinear optical properties, single crystal growth and applications within the optical maser systems in line with their development history. This chapter provides a comprehensive perspective on this development and necessary improvement within the way forward for inorganic nonlinear optical materials.

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