Chapter One

Introduction

1.1 Materials Sscience

The interdisciplinary field of materials science, also commonly known as materials science and engineering, involves the discovery and design of new materials, with an emphasis on solids. The intellectual origins of materials science stem from chemistry, physics, and engineering to understand ancient phenomenological observations in metallurgy and mineralogy. Materials science still incorporates elements of physics, chemistry, and engineering. As such, the field was long thought of as a sub-field of these related fields. In recent years materials science has become more widely recognized as a specific and distinct field of science and engineering. Many of the most pressing scientific problems humans currently face are due to the limitations of the materials that are available and, as a result, breakthroughs in materials science are likely to affect the future of technology significantly[1,2].

Composites are one of the most advanced and adaptable engineering materials known to men. Progresses in the field of materials science and technology have given birth to these fascinating and wonderful materials[3].

Composites are heterogeneous in nature, created by the assembly of two or more components with fillers or reinforcing fibers and a compactable matrix . The matrix may be metallic, ceramic or polymeric in origin. It gives the composites their shape, surface appearance, environmental tolerance and overall durability while the fibrous reinforcement carries most of the structural loads thus giving macroscopic stiffness and strength [4] A composite material can provide superior and unique mechanical and physical properties because it combines the most desirable properties of its constituents while suppressing their least desirable properties. At present composite materials play a key role in aerospace industry, automobile industry and other engineering applications as they exhibit outstanding strength to weight and modulus to weight ratio. High performance rigid composites made from glass, graphite, Kevlar, boron or silicon carbide fibers in polymeric matrices have been studied extensively because of their application in aerospace and space vehicle technology . Based on the matrix material which forms the continuous phase[5] .

1.2 Problem of the Study

The main problem of this study there selected materials are founded naturally or artificially abundance and low cost for these reasons those material must be inspected to know some properties in the order to be used in particular fields to get some benefits.

1.3 Purpose of the Study

The purposes of this research to study light characteristics on some materials powder and study their characteristics as they are composited on the effect of light in addition to know role of the mass material to lost energy of the light.

1.4 The Literature Review :

There are many attempt to know some materials characteristics by making composite with different ways like :

The first study had been done by D. J. Tan, etal (2014)- for that study There were many problems when natural flake graphite was used in gypsum as an absorbing agent, such as absorbing large amount of water, a poor interfacial compatibility and so on. Polycarboxylate-based water reducer and AES (sodium alcohol ether sulphate) are used to modify graphite-gypsum system. The results show that both agents are effective to improve the properties of gypsum system and the former is best. Compared with the sample without any reagents, polycarboxylate-based water reducer can reduce the water-solid ratio from 1.1 to 0.9, increase the compressive strength from 0.106Mpa to 0.701Mpa and the flexural strength form 0.064Mpa to 0.312Mpa [6].

The Second study was done by N. Flores Medina ,etal (2016) The study here exposed was developed in order to contribute to the recycling and re-valorization of isostatic graphite powder as filler in gypsum pastes. Graphite powder I a waste product obtained from isostatic graphite blocks ground for mold production. The design of these molds is previously processed by Computer-Aided Manufacturing (CAM) and CAD/CAM software applications that uses a tool path for three-dimensional modeling to assist computer-numerically controlled (CNC). In order to contribute to the knowledge of this material as filler, this paper describes and assesses the microstructure of gypsums with graphite, through the use of a Scanning Electron Microscope and an Energy Dispersive X-ray Spectroscopy (SEM/EDX). Furthermore, the density, water absorption, and mechanical properties of gypsum pastes with addition of graphite filler have been analyzed. In order to deepen on the knowledge of the influence in the behavior of gypsum commonly used in building, several series of gypsum pastes with 0–5–10–15–20–25% of graphite filler by weight replacement of gypsum, and three different water/gypsum ratios – one of them with plasticizer – have been tested. It was observed that isostatic graphite powder from milled molds for Electrical Discharge Machining (EDM) significantly increases the mechanical properties of the gypsum pastes, more than other conventional fillers. This has been achieved by the great compatibility of the gypsum microstructure and the graphite micro-grains, which fill the microstructure of the pastes and increase the density of the hardened paste. The progressive increase of the amount of graphite influences the pastes properties, increasing their density and their mechanical resistances and reducing their porosity[7] .

1.5 Thesis Layout:

The thesis consists of four chapters : chapter one discuss about general introduction of materials science , chapter two about Maxwell's equations, chapter three about materials and chapter four about materials samples and Experimental work.

Chapter Two

Maxwell's Equations

2.1 Introduction

Electromagnetic fields are caused by electric charges at rest and in motion. Positive and negative electric charges are sources of the electric fields and moving electric charges yielding a current is the source of magnetic fields. Time-varying electric and magnetic fields are coupled in an electromagnetic field radiating from the source. This chapter is concerns with the properties of electromagnetic field[8,9].

2.2 Maxwell's Equations

Static electric charge generated electric field of flux density D ,where

$$D = \varepsilon E \qquad (2.1)$$

Where ε stands for electric permittivity of the medium and E is the electric field intensity .when this charge moves it generates magnetic field flux density B , where[9,10].

$$B = \mu H \qquad (2.2)$$

where μ stands for electric permittivity of the medium and H is the magnetic field intensity.

Maxwell's equations related electric field to magnetic field . According to the relations:

$$\nabla . D = \rho \qquad (2.3)$$

Where ρ represents to the charge density

$$\nabla . B = 0 \qquad (2.4)$$

$$\nabla \times \mathrm{H} = \mathrm{J} + \frac{\partial \mathrm{D}}{\partial \mathrm{t}} \tag{2.5}$$

Where J is the current density

$$\nabla \times \mathrm{E} = -\frac{\partial \mathrm{B}}{\partial \mathrm{t}} \tag{2.6}$$

2.3 Reflection ,Refraction , Transmission and Absorption

2.3.1Reflection:

The Reflection is when waves, whether physical or electromagnetic, bounce from a surface back toward the source. A mirror reflects the image of the observer[10,11].

$$\Gamma = \frac{E_r}{E_i} \tag{2.7}$$

Where Γ is reflection coefficient , $E_r$is reflection energy and E_iIncident energy.

2.3.2 Refraction :

The Refraction is when waves, whether physical or electromagnetic, are deflected when the waves go through a substance. The wave generally changes the angle of its general direction.

3.3.3Transmission:

transmission is the passage of electromagnetic radiation through a medium.

$$T = \frac{E_t}{E_i} \tag{2.8}$$

Where T is transmission coefficient and E_t is transmitted energy

2.3.6 Absorption:

Absorption is the transformation of radiant power to another type of energy, usually heat, by interaction with matter which as shown in fig (2,1)[10,11].

$$\propto = \frac{E_a}{E_i} \qquad (2.9)$$

where α is Absorption coefficient and E_a is absorbed energy .

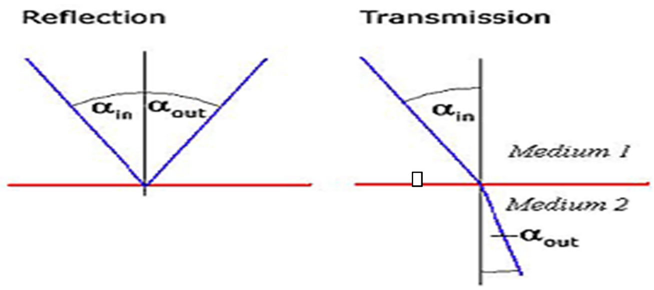


Fig (2.1) Reflection and Transmission

By using some useful physical laws and equations .the Transmission , Reflection and Absorption coefficients (T, Γ and α respectively) satisfies the relation :

$$T + \Gamma + \alpha = 1 \qquad (2.10)$$

With conceder incident energy (E) as intensity (I) the relation:

$$\boldsymbol{I = I_0 e^{-\propto d}} \qquad (2.11)$$

Where I is stands for transmitted intensity , I_0 is incident intensity and d is thickness of the material(d = o.4mm= 0.0004m) .there Absorption coefficient can be :

$$\propto = (ln\frac{I_0}{I})/d \qquad (2.12)$$

Transmission Coefficient will be:

$$\mathbf{T} = \frac{I_0}{I} \qquad (2.13)$$

From equation (2.2 .10) the Reflection Coefficient will be :

$$\Gamma = 1 - T - \alpha \qquad (2.14)$$

2.4 laser properties

The laser means **L**ight **A**mplification by **S**timulation **E**mission of **R**adiation the laser is a light source that exhibits unique properties and a wide variety of applications because of its properties like[12] :

2.4.1 Monochromatic:

That it is one wavelength(color) .in contrast ordinary white is combination of many different wavelengths(colors) .

2.4.2 Directional :

laser light is emitted as relative narrow beam in specific direction as in fig (2.2).

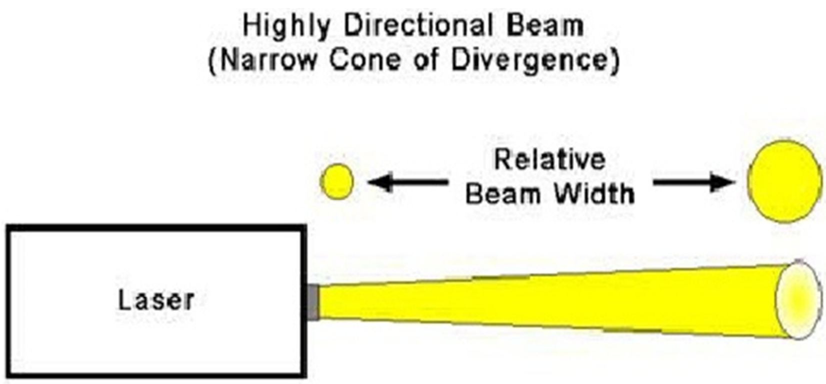


Fig (2.2)Directionality of laser light

2.4.3 Coherence :

Coherence of laser which means the wave lengths of the laser are in phase of space and time as in fig (2.3)[12].

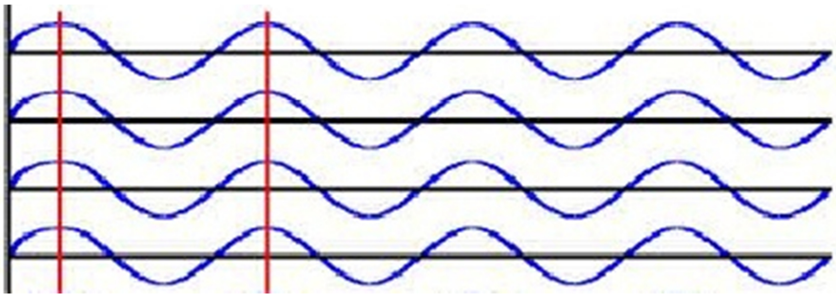


Fig (2.3) Coherent light waves

The energy of the light wave length :

$$qU = \frac{1}{2mv^2} = \frac{h^2}{2m} \cdot \frac{1}{\lambda^2} \qquad (2.15)$$

$$\lambda = \sqrt{\frac{h}{2mqv}} \qquad (2.16)$$

where:

v ≡velocity , λ≡ wavelength , h ≡ plank's constant , q ≡ electric charge and m ≡ mass

$$v = \sqrt{\frac{2Uq}{m}} \qquad (2.17)$$

$$I = E = \frac{hc}{\lambda} = qU \qquad (2.18)$$

Where : U ≡ voltage , I≡ intensity and c ≡ speed of light

Chapter Three

Materials

3.1 Introduction

Materials are physical substances used as inputs to production or manufacturing. Raw materials are first extracted or harvested from the earth and divided into a form that can be easily transported and stored, then processed to produce "semi-finished materials". These can be input into a new cycle of production and "finishing processes to create "finished materials", ready for distribution and consumption[13].

3.1.1 Metals

Metals are materials that are normally combinations of "metallic elements". These elements, when combined, usually have electrons that are non-localized and as a consequence have generic types of properties. Metals usually are good conductors of heat and electricity. They are also quite strong but deformable and tend to have a lustrous look when polished.

3.1.2Ceramics

Ceramics are generally compounds between metallic and nonmetallic elements and include such compounds as oxides, nitrides, and carbides. Typically they are insulating and resistant to high temperatures and harsh environments.

3.1.3Plastics

Plastics, also known as polymers, are generally organic compounds based upon carbon and hydrogen. They are very large molecular structures. Usually they are low density and are not stable at high temperatures[13].

3.1.4 Semiconductors

Semiconductors have electrical properties intermediate between metallic conductors and ceramic insulators. Electrical properties are strongly dependent upon small amounts of impurities.

3.1.5 Composites

Composites consist of more than one material type. Fiberglass, a combination of glass and a polymer, is an example. Concrete and plywood are other familiar composites. Many new combinations include ceramic fibers in metal or polymer matrix. Fig (3.1) materials.

Fig (3.1) materials

3.2 Processing

Processing refers to the way in which a material is achieved. Advances in technology have made it possible to create a material atomic layer by atomic layer. There are four general categories which may be useful to know: solidification processing, powder processing, deposition processing, and deformation processing[13,14].

3.2.1 Solidification Processing

Most metals are formed by creating an alloy in the molten state, where it is relatively easy to mix the components. This process is also utilized for glasses and some polymers. Once the proper temperature and composition have been achieved, the melt is cast. Castings can be divided into two types, depending on the subsequent processing steps. The first type is shape casting, which takes advantage of the fluidity of liquid metal to form complex shapes directly. Because of the complexity of their part geometries, these castings generally cannot be worked mechanically to a significant degree. Therefore any changes in microstructure or properties must either be achieved first during solidification or through subsequent heat treatments[13,14].

3.2.2 Powder Processing

Powder processing involves consolidation, or packing, of particulate to form a `green body'. Densification follows, usually by sintering. There are two basic methods of consolidating powders: either dry powder can be compacted in a die, a process known as dry-pressing, or the particles can be suspended in a liquid and then filtered against the walls of a porous mold in a process known as slip-casting or filter pressing. Bulk ceramics are usually processed in powder form since their high melting points and low formability prohibit other types of processing.

3.2.3Deposition Processing

Deposition processing modifies a surface chemically, usually by depositing a chemical vapor or ions onto a surface. It is used in semiconductor processing and for decorative or protective coatings. Vapor source methods require a vacuum to transport the gaseous source of atoms to the surface for deposition. Common vapor sources are thermal evaporation (similar to boiling water to create steam), sputtering (using energetic ions to bombard a source and create the gas state), or laser light (ablates, or removes, atoms from surface to create the gaseous state). Other sources use carrier media such as electrochemical mixtures (ions in a solution transported by an electrical field to the surface for depositions) or spray coating (ions or small particles transported by gases, liquids, and/or electrical field).

3.2.4 Deformation Processing

One of the most common processes is the deformation of a solid to create a desired shape. A large force is generally used to accomplish the deformation, and many techniques heat the material in order to reduce the force necessary to deform it.

Sometimes a mold is used to define the shape. Forging, an old method that heated the metal and deformed the metal by hammer blows is still used today, albeit with multi-ton hammers. Rolling to reduce the thickness of a plate is another common process. Some glasses when heated can be formed with tools or molds. Other common methods, like drilling to make holes, or milling, are machining versions of the deformation process.

3.3Structure

Structure refers to the arrangement of a material's components from an atomic to a macro scale. Understanding the structure of a substance is key to understanding the state or condition of a material, information which is then correlated with the processing of the material in tandem with its properties. Understanding these relationships is an intrinsic part of materials science engineering, as it allows engineers to manipulate the properties of a material[15].

3.4 Properties

A material need to be strong , heat-resistant and lightweight products of materials have specific requirements which necessitate the use of materials with unique properties. Materials engineers must frequently reconcile the desired properties of a material with its structural state to ensure compatibility with its selected processing. Typical properties of interest may be classified into[15]:

3.4.1 Mechanical Properties: There are many types Mechanical Properties like:

Tensile strength, fracture toughness, fatigue strength, creep strength and hardness.

3.4.2 Electrical Properties: there are many types Electrical Properties like:

Conductivity or resistivity, ionic conductivity, semiconductor conductivity (mobility of holes and electrons)

3.4.3 Magnetic Properties : There are many types Magnetic Properties like**:**

Magnetic susceptibility, Curie Temperature, Neel Temperature, saturation magnetization

3.4.4 Optical and Dielectric Properties: There are many types Optical Properties like**:**

Polarization, capacitance, permittivity, refractive index and absorption.

3.4.5 Thermal Properties: There are many types Thermal Properties like**:**

Coefficient of thermal expansion, heat capacity, thermal conductivity of some materials show in table (2.1) :

Table (2.1) shows thermal conductivity of elected materials

Material	k (J/s·m·K)
Aluminum	237
Concrete	1
Copper	386
Glass	0.9
Stainless Steel	16.5
Water	0.6

3.5 Performance

The evaluation of performance is an integral part of the field. The analysis of failed products is often used to obtain feedback on processing and its control as well as to assist in the initial selection of the material and in the stages of processing. Testing also ensures that the product meets performance requirements. In many products the control of its processing is closely associated with some property test and/or a structural characterization[16].

3.6 Natural composites

Natural composites exist in both animals and plants. Wood is a composite – it is made from long cellulose fibers (a polymer) held together by a much weaker substance called lignin. Cellulose is also found in cotton, but without the lignin to bind it together it is much weaker. The two weak substances – lignin and cellulose – together form a much stronger one. The bone in your body is also a composite. It is made from a hard but brittle material called hydroxyapatite (which is mainly calcium phosphate) and a soft and flexible material called collagen(which is a protein)[16].

3.7 Common Categories of Composite Materials

Based on the form of reinforcement, common composite materials can be classified as following [16][17]:

1. Fibers as the reinforcement (Fibrous Composites):

   a. Random fiber (short fiber) reinforced composites Fig (3.2)

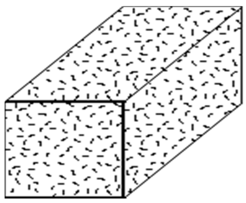


Fig (3.2) shows Fibrous Composite

   b. Continuous fiber (long fiber) reinforced composites Fig (3.3)

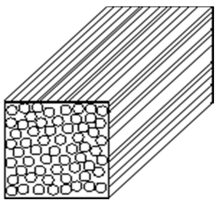


Fig (3.3) shows Continuous fiber(long fiber)

2. Particles as the reinforcement (Particulate composites) Fig (3.4)

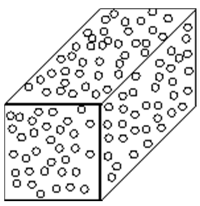


Fig (3.4) shows Particulate composite

3. Flat flakes as the reinforcement (Flake composites) fig (3.5)

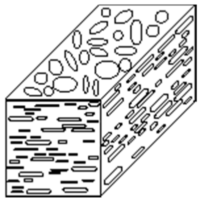


Fig (3.5) shows Flake composite

4. Fillers as the reinforcement (Filler composites) Fig (3.6)

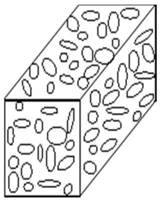


Fig (3.6) shows Filler composite

3.8 Constituents of Composite Material

Composite material consists at least two basic materials they are Matrix material it could be continuous and Reinforcement material - discontinuous- stronger - harder[18,19] Fig (3.7) describes Constituents 0f composite material.

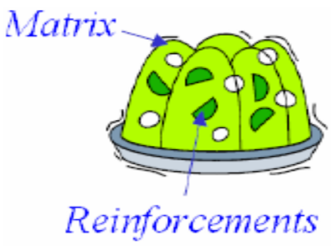


Fig (3.7) shows composite material Constituent

3. 8.1 Functions a Matrix Material

Holds the fibers together to Protect the fibers from environment effects and Protects the fibers from abrasion (with each other) beside it Helps to maintain the distribution of fibers[19]

3.8.2 Functions of a Reinforcement

Contribute desired properties ,Load carrying and Transfer the strength to matrix

3 .9 Composite Material Structure

The structure of a composite is commonly such that one of the components is the matrix while the other components are fillers bound by the matrix, which is often called the binder. For example, in carbon fiber reinforced polymer, which is important for lightweight structures, the polymer is the matrix, while the carbon fiber is the filler. In case of a structural composite, the filler usually serves as a reinforcement. For example[19,20]:

3.10 Classes of Composite Materials.

These materials have low specific gravity that make their properties particularly better in strength and models Composite materials are constructed from two or more elements to provide a material that has different properties from the individual elements Composite materials that exist today can be categorized into five major classes are :

3. 10.1 Polymer Matrix Composites (PMCs)

Polymer Matrix Composites (PMCs) are the most common composites, and are also known as Fiber Reinforced Polymers (or Plastics) FRP. These materials use a polymer-based resin as the matrix, and a variety of fibers such as glass, carbon and aramid as the reinforcement. Matrix materials are thermosetting thermoplastic, elastomer, and rigid rod plastic, thermoplastic plastic polymers. Reinforcing fibers are either continuous or chopped. In general, polymer composites processing includes contracting of polymer and fibers, shaping, controlled heating and/ or reactions .

3.10.2 Metal Matrix Composites (MMCs)

Metal matrix composites can be obtained using either a primary liquid phase approach such as squeeze casting/infiltration or spray deposition, or a primary solid state processing such as powder techniques and foil diffusion. Common MMCs are aluminum based MMCs, fiber reinforced titanium alloys, and magnesium alloy-SiC particulate MMC. The aluminum-based materials are the most popular for reasons of cost and ease of fabrication.[20,21].

3.10.3 Ceramic Matrix Composites (CMCs)

Ceramic Matrix Composites (CMCs) are used for very high temperature environments. The definition of the ceramic matrix can be rather broad. It includes inorganic silica-based glasses, crystalline ceramics, glass-ceramics, intermetallic and carbon. All of these have implicit unifying thread in that they are fairly high temperature structural materials.

3.10.4 Carbon - Carbon Composite (CCC s)

The development of carbon-carbon materials began in 1958 and was nurtured under the US Air Force space plan program DynaSoar, and NASA 3 Apollo projects Carbon-carbon materials are a generic class of composites much like graphite /epoxy family of polymer matrix composites[22.23].

3.10.5 Intermetallic Matrix Composites (IMC s).

Several major problems limit the development of inter-metallic-matrix composites (IMCs), including chemical incompatibility and CTE mismatch between potential reinforcing fibers and matrix materials, poor low- temperature ductility, and marginal high-temperature oxidation resistance of intermetallic materials. Composite fabrication and joining processes do not result in excessive fiber/matrix reaction or matrix contamination. [23,24]

3.11 Disadvantages of Composite Materials

High cost of raw materials and fabrication ,the Composites are brittle and thus are more easily damageable their Transverse properties may be weak ,the Matrix is weak, therefore, low toughness and addition Reuse and disposal may be difficult so that there are Health hazards during manufacturing , during and after use and Joining to parts is difficult.[25,26]

Chapter Four

Materials and methods

4.1 Introduction

Materials have always been an integral of human and social development .the selection of Materials and most appropriate manufacturing process depends on several factors , but the most important considerations are shape complexity and properties of Material ,however the properties of Materials are ultimately linked with microstructure and processing. The Materials used in the experimental work for this research are Graphite (C)and Gypsum ($CaSO_4.2H_2O$).

4.2 Materials samples

The Materials used in this experiment are selected according to the several criteria on which the final decision is normally based , beside of their abundance the Materials selected are :

4.2.1 Graphite

Graphite is a mineral composed exclusively of element carbon . Graphite has the same chemical composition as Diamond which is also pure carbon ,but the molecular structure of Graphite and Diamond is inertly different this causes almost opposite characteristics in their physical properties . Graphite is rather common mineral ,but fine crystal are rare ,most Graphite mining areas produce enormous quantities from a single or several large Graphite veins , but collector specimen is good are commonly uncounted[27] fig (4.1)shows Graphite sample. Table (4.1) Shows Some Physical Properties of Graphite

Physical Properties	Describe
Hardness	1-2
Crystal system	hexagonal
Transparency	opaque
Luster	metallic

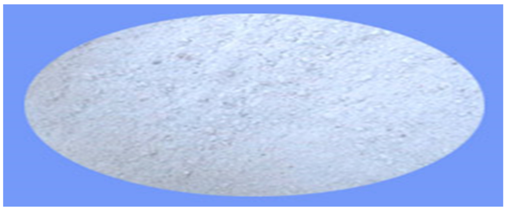
4.2.2 Gypsum

The mineral gypsum precipitated 100 t0 200 million years ago when sea water evaporated from a chemical point of view it is calcium sulphate Dihydrate (CaSO4.2H2O) deposited in sedimentary layers on the sea bed . under high pressure and temperature gypsum turns into Anhydrite (CaSO4).In the nature gypsum and Anhydrite occur or nodular masses up to a few meters thick.The content of gypsum in sedimentary rock varies from 75% to 95 % the rest being clay and chalk fig (4.2) shows Gypsum sample[28].

Table (4.2) Shows Some Physical Properties of Gypsum

Physical Properties	Describe
System	monoclinic
Hardness	2
Transparency	transparent ,translucent , opaque
Tenacity	flexible
Density	3.312 - 2.322 g/cm3 (measured 2.308 g/cm3 (calculated)

Fig(4.1) Graphite



Fig(4.2) Gypsum

4.3 Experimental part

The main purposes of this part description of the experimental setup used for released of light on material as well as the materials used beside of the procedures requested .

4.4 Equipments

In this experiment the equipments used are :

4.4.1 Photoelectrical cell

Photoelectrical cell is an electronic device that converts light into electrical energy by producing a voltage or that uses light to regulate the flow of current ,it is used in automatic control system for doors , burglar alarm, lighting etc figure (4.3) shows symbolic representation of photoelectric cell .

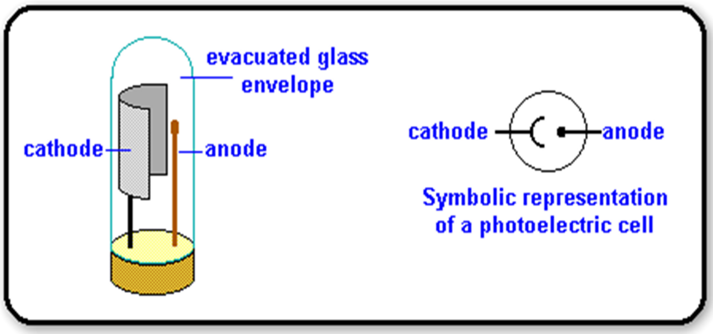


figure (4.3) symbolic representation of photoelectric cell .

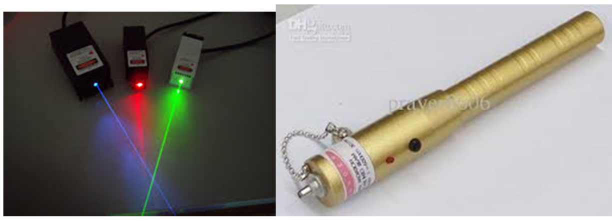
4.4.2 AVO Meter

AVO Meter is a device to measure current , voltage and electrical resistance . AVO Meter is short hand notation of the word Ampere Volt Ohm meter. Figure(4.4) shows a photo picture of AVO Meter

Figure(4.4) of AVO Meter

4.4.3 Laser Light Source

Laser is a device that emits electromagnetic radiation through a process of optical amplification based on the stimulated emission of photons . lasers are devices that produce intense beams of light which monochromatic , coherent and highly collimated . the wave length of laser light is extremely pure when compared to other sources of light all photons that make up the laser beam have a fixed phase relationship with respect to one another .light from a laser typically has very low divergence . fig(4.5) shows photo picture of laser source



fig(4.5) Symbolic of laser source

4.4.4 Slice of Glass

The main characteristics of glass are transparency , heat resistance , pressure and breaking resistance and chemical resistance . glass refractive index is 1.52 fig(4.6) shows symbolic slice of glass.

Fig(4.6) slice of a glass

4.4.5 white Light source

Light is electromagnetic radiation within a certain portion of the electromagnetic spectrum .The word usually refers to visible light , which visible to the human eye and it is responsible for the sense of slight fig(4.5) shows photo picture of white light source.

Fig(4.7) Symbolic of white light source

4.5 Experimental Set up :

The setup is shown schematically in figure (4.8-A), It was composed of laser source , AVO meter, photocell and slice of glass (with material).

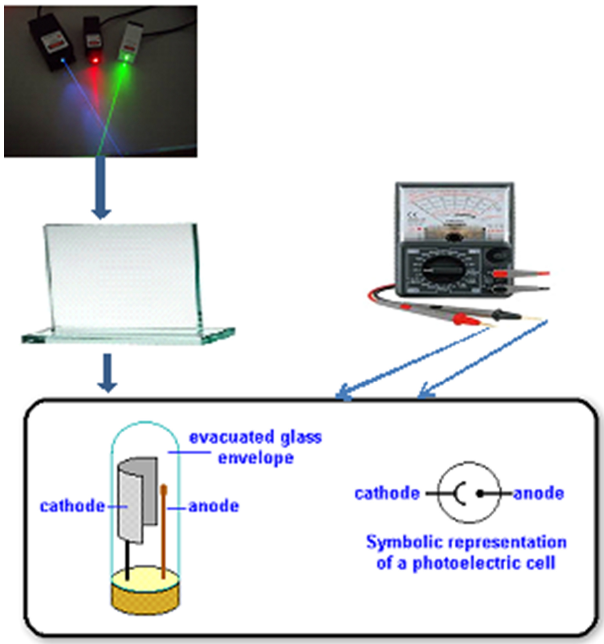


Fig (4.8-A) schematic diagram of experiment of using laser source

The setup is shown again in figure (4.10-B)physically, it was composed of white light source , AVO meter, photocell and slice of glass (with material).

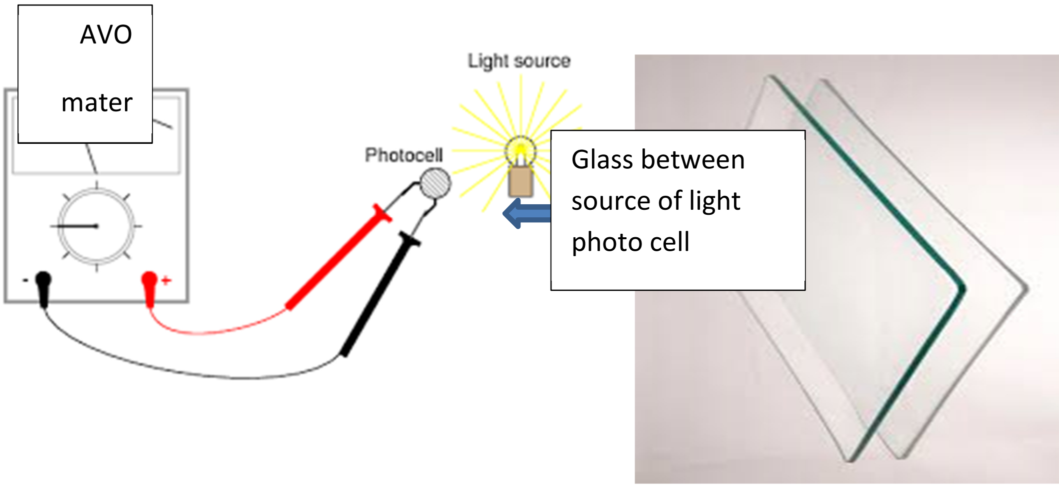


Fig (4.8-B) schematic diagram of experiment of using white light source

4.6 Experimental Procedures

Gypsum and Graphite materials in powder form are exposed first to Laser and Light at distances 10cm and 15cm respectively .The powder was put on glass substrate and the light sources above it illuminate the sample .the AVO meter was mounted below the sample and glass , to take the reading of the voltage resulting from exposure of photo cell detector to light .By this way was taken different grams of gypsum and graphite separately and taken as mixture in different ratios.

4.7 Results and Discussions:

4.7.1 Results of Gypsum Graphite Separately

Tables (4.3)to (4.6) the results of gypsum and graphite separately be- fore making mixture of two materials the mass increasing ratio was constant rate from (o.5) followed by decreasing of voltage with any increasing of mass in distances of 10 cm and 15cm of laser and Wight light

Table (4.3) Results of Laser for Graphite with at Distances 10cm and 15cm

Mass (g) $\pm 0.1mg$	V(Volts) ± 1mv -10cm	V(Volts) ± 1mv-15cm
0.5	0.8	0.6
1	0.6	0.4
1.5	0.4	0.3
2	0.3	0.2
2.5	0.2	0.2

Table (4.4) Results of white Light for Graphite at Distances10cm and 15cm

Mass (g) $\pm 0.1mg$	V(Volts) ± 1mv-10cm	V(Volts) ± 1mv-15cm
0.5	6.2	6.4
1	4.6	4.0
1.5	3.4	3.8
2	2.0	1.6
2.5	1.6	1.2

Table (4.5) Results of Laser for Gypsum at Distances 10cm and 15cm

Mass (g) $\pm 0.1mg$	V(Volts) ± 1mv-10cm	V(Volts) ± 1mv-15cm
0.5	1.5	1.4
1	1.2	1.2
1.5	0.8	0.8
2	0.5	0.5
2.5	0.4	0.3

Table (4.6) results of white light for Gypsum at distances 10cm and 15cm

Mass (g) $\pm 0.1mg$	V(Volts) ± 1mv-10cm	V(Volts) ± 1mv-15cm
0.5	24.2	20.7
1	18.6	16.2
1.5	15.5	12.0
2	13.2	6.4
2.5	8.3	5.1

4.7.2 Results of Gypsum Graphite as composite :

By using equations (2.16) and (2.17)to calculate velocity(V1 =7.1×10^{5}m/s) for white light (V2=20.5×10^{5}m/s)and wavelength(ʎ1= 3.7 $\times10^{11}$m),(ʎ2= 6.20$\times10^{11}$m) respectively for laser and white light also Incident intensity according to equation (2.18) for laser:(I_0 =23.5 × $1o^{(-22)}$ w/m^2)and for white light (I_0=192× $1o^{(-22)}$ w/m^2). The gypsum was used as matrix material and graphite as reinforcement materials in ratio of (4:1)or(1to 0.25) every time increase this rate of gypsum and graphite followed changing of voltage reading by this has gotten this resulting in addition of some calculations to following resulting

Table (4.7) Results of Laser for Composite of Gypsum and Graphite with ratio(4:1) at a distance 10cm from source

Mass (g) ± 0.1mg	Voltage(u)volt	Velocity(v) $\times10^{5}$m/s	Wave length(ʎ) $\times10^{11}$m	Intensity(i) × $1o^{(-22)}$ w/m^2
0.5	0.9	1.7	1.8	1.44
1.0	0.7	1.5	1.7	1.12
1.5	0.6	1.4	1.6	0.96
2.0	0.4	1.1	1.4	0.64
2.5	0.4	1.1	1.4	0.64

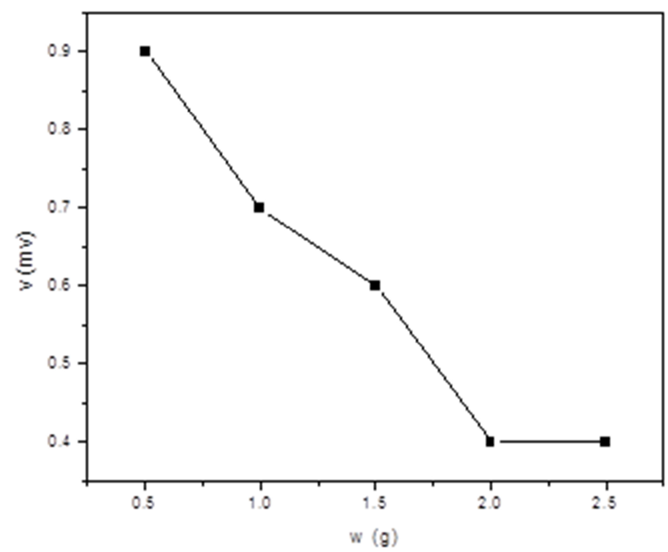


Fig (4.9) Results of Laser for composite Gypsum and Graphite with ratio (4:1) at Distance 10cm from source

Fig (4.8) Results of white light for composite Gypsum and Graphite with ratio (4:1) at Distance 10cm from source

Mass (g) $\pm 0.1mg$	Voltage(u)volt	Velocity(v) $\times 10^5 m/s$	Wave length(ʎ) $\times 10^{11} m$	Intensity(i) $\times 1o^{(-22)}$ w/m^2
0.5	22.6	8.9	4.09	36.16
1.0	18.2	8.0	3.70	29.12
1.5	12.4	6.6	3.52	19.84
2.0	10.5	4.8	3.10	16.8o
2.5	6.90	4.4	3.00	11.00

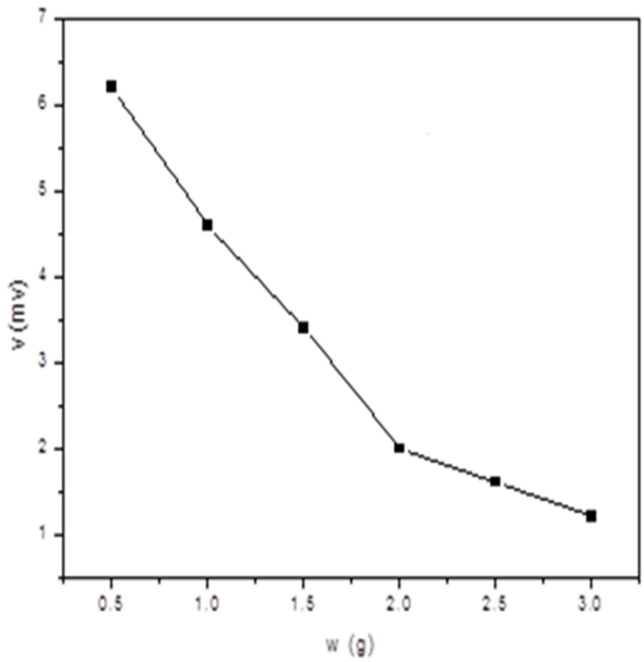


Fig (4.10)) Results of white light for composite Gypsum and Graphite with ratio (4:1) at Distance 10cm from source

Table (4.9) Results of Laser for Composite of Gypsum and Graphite with ratio(4:1) at a distance 15cm from source

Mass (g) $\pm 0.1mg$	Voltage(u)volt	Velocity(v) $\times 10^5 m/s$	Wave length(ʎ) $\times 10^{11} m$	Intensity(i) $\times 1o^{(-22)}$ w/m^2
0.5	0.7	1.6	1.7	1.12
1.0	0.5	1.3	1.6	0.80
1.5	0.4	1.1	1.4	0.64
2.0	0.3	1.0	1.3	0.48
2.5	0.3	1.0	1.3	0.48

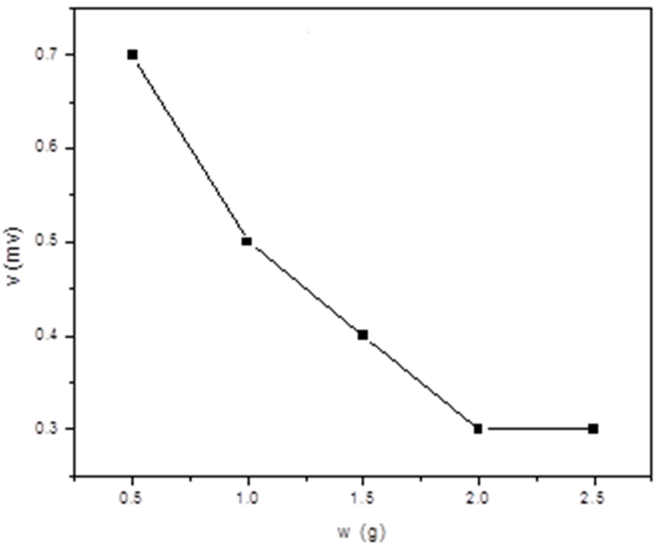


Fig (4.11) Results of Laser for Composite of Gypsum and Graphite with ratio(4:1) at a distance 15cm from source

Fig (4.10) Results of white light for composite Gypsum and Graphite with ratio (4:1) at Distance 15cm from source

Mass (g) $\pm 0.1mg$	Voltage(u)volt	Velocity(v) $\times 10^5 m/s$	Wave length(ʎ) $\times 10^{11} m$	Intensity(i) $\times 1o^{(-22)}$ w/m^2
0.5	18.12	7.9	3.8	29.12
1.0	12.7	6.6	3.4	20.32
1.5	9.2	5.6	3.1	14.72
2.0	7.8	5.2	3.0	12.48
2.5	6.6	4.8	2.9	10.56

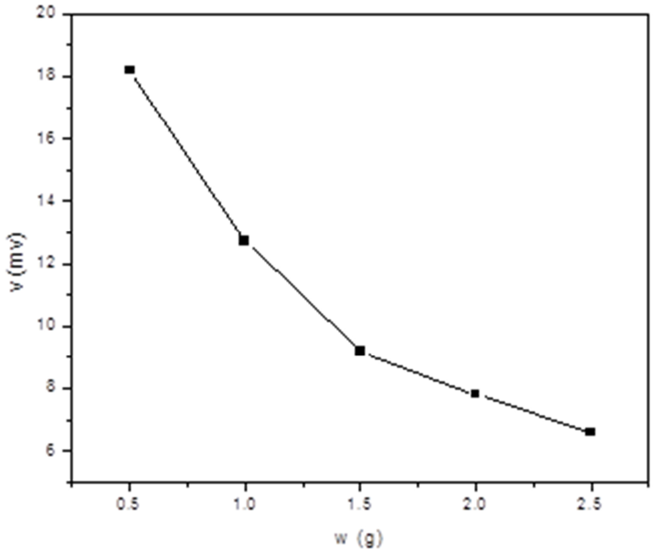


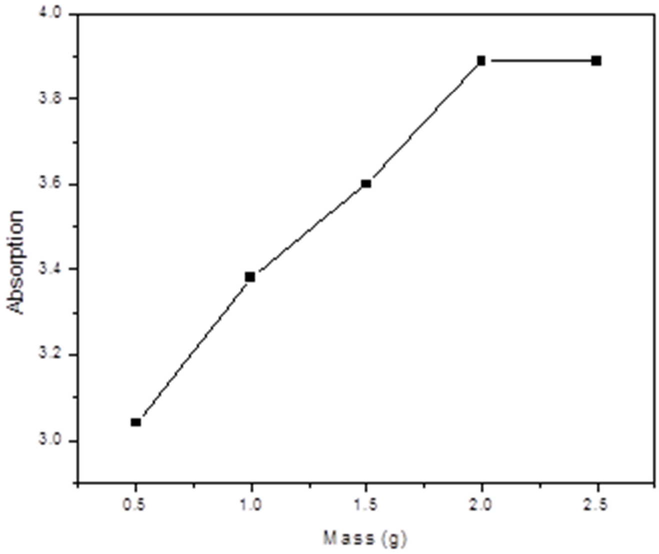
Fig (4.12) Results of white light for composite Gypsum and Graphite with ratio (4:1) at Distance 15cm from source

4.7.3 Coefficients :

By using equations (2.12),(2.13)and(2.14) to find Absorptio,Transmission and Reflection Coefficients .

Table (4.11) Three Coefficients of Gypsum and Graphite (4:1)ratio by Using Laser- Absorption and Reflection Coefficients of Laser the experimental shows the greatest amount at the maximum amount of mass this means absorption and reflection are increase with increases of the mass as in the table below according to this facts gypsum and graphite composite can be used as a filter or application of this composite to improve to the cases of absorption and reflection in particular field the fig (4.13) shows the between mass and absorption representing some results in reflection case . Transmission through gypsum and graphite composite the experimental shows that when the mass increases the amount of transmission decreases there is inverse proportional between transmission and mass the fig(4.14) explain the relation between mass and transmission. According to this result gypsum and graphite composite as transmission filter .

mass$\pm\mathbf{0.1mg}$	Absorption	Transmission	Reflection
0.5	3.04	0.047	2.087
1	3.38	0.034	2.414
1.5	3.60	0.027	2.627
2	3.89	0.020	2.910
2.5	3.89	0.020	2.910



Fig(4.13) Mass Versus Absorption Of Laser By Gypsum Graphite Composite(4:1)ratio

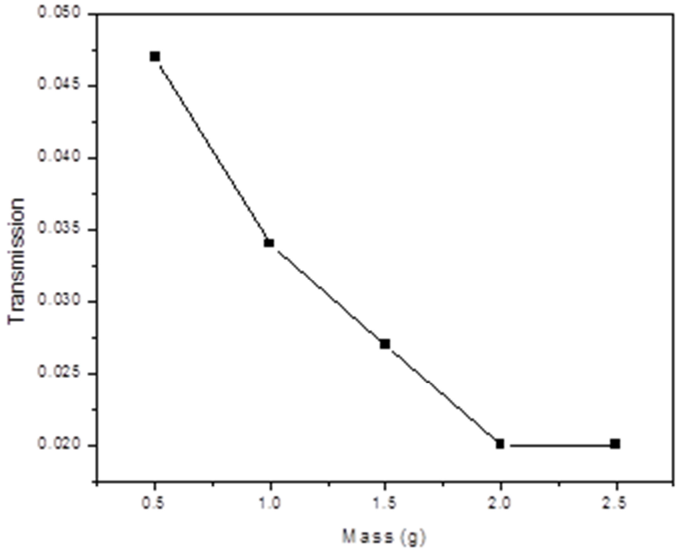
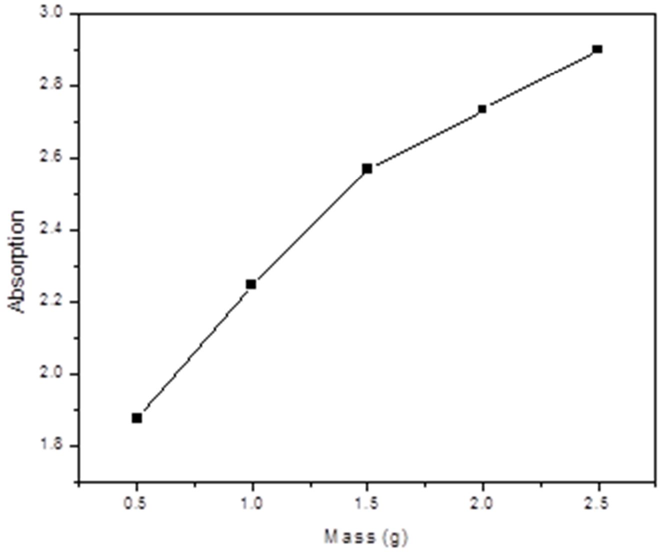


Fig (4.14) Mass Versus Transmission Of Laser Through Gypsum Graphite Composite(4:1)ratio

Table (4. 12) Three Coefficients of Gypsum and Graphite(4:1)ratio by Using White Light- Absorption and Reflection Coefficients of white light the experimental shows the greatest amount at the maximum amount of mass this means absorption and reflection are increase with increases of the mass as in the table below according to this facts gypsum and graphite composite can be used as a filter or application of this composite to improve to the cases of absorption and reflection in particular field .the fig (4.15). Transmission through gypsum and graphite composite the experimental shows that when the mass increases the amount of transmission decreases there is inverse proportional between transmission and mass the fig(4.16) for white light explain the relation between mass and transmission. According to this result gypsum and graphite composite as transmission filter .

mass$\pm$**0. 1mg**	Absorption	Transmission	Reflection
0.5	1.875	0.153	1.028
1	2.245	0.105	1.350
1.5	2.568	0.076	1.644
2	2.733	0.065	1.798
2.5	2.900	0.055	1.950



Fig(4.15) Mass Versus Absorption Of White Light By Gypsum Graphite Composite(4:1)ratio

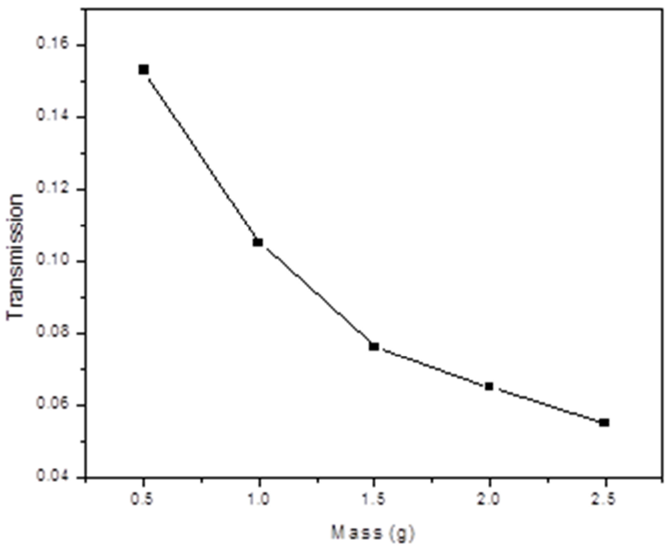


Fig (4.16) Mass versus Transmission of white light through gypsum graphite composite

4.8 Conclusion

The experimental work indicates that light properties are changed with the change of masses of material the change created different relation between mass and properties of the light as speed of light like any wave is dependent upon the properties of the medium through which it moving .

For gypsum –graphite data and process requirement for stable composite according to the stander to the composite quality assurance .

The results show that both gypsum and graphite are effective to improve properties to the best ,when two materials quantity is equal give good effects.

4.9 Recommendations :

In order obtaining better results the experimental must improving by following :

1-Composite material must undergoes the rules mixture to give better quality in its properties.

2-Two materials of composite must have different properties to be improved in their properties by mixing .

3- The sources of light must be strong enough to give better results.

4- For more details have to use advanced instruments to measure some other physical properties about this composite .

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