Plasmonics per the Ultra-Space Field Theory

Keith D. Foote
Ann Arbor, MI

This thesis describes plasmonics using the Ultra-Space Field Theory[1]. It describes plasmonics as part of a material's electromagnetic field.

All matter, from protons to complex elements, present an electromagnetic barrier, half of which is known as the plasmonic (electrical) field. The other 'magnetic' half of this field is generally ignored due to historical assumptions about magnetism that have not been reexamined. (A subconsciously-based cultural prejudice in the physics community has developed, resulting in the loss of magnetic field research.) Each form of matter has its own EM barrier/plasmonic field characteristics, with color being one of the variables. Color is a form of reflection.

EM barrier pulses, more commonly referred to as plasmonics, are waves moving within a dense electromagnetic field immediately surrounding protons and contained within matter. The waves are the collective effect of moving or shifting electrons within the EM field and include the movements of underlying magnetic and thermal fields extending from the atoms' core. The atoms and electrons of matter develop a unified rhythm. Metals provide the most obvious examples of plasmonics, due to the numerous electrons at their surface. Currently, most plasmonics literature describe the layer of electrons as independent of atoms and simply resting on the surface of a metal. This paradigm describes them as exposed orbital electrons, and part of the atomic structure.

The term plasmonics, and plasmon, originates from research on the movement of electrical currents in a plasma cloud. It was, unfortunately, borrowed to describe waves moving through electric fields in, and surrounding, solid matter. The rationalization for using the word plasmonics in this way was based on the concept of 'quantum plasma', describing electron density. The word plasmon, with its 'o-n' ending, suggests a subatomic particle capable of an independent existence, but this has never been confirmed and at present, the plasmon is a considered to be a unit of the collective behavior of electrons. The terms plasmon and plasmonics are confusing because of their association with plasma and the suggestion of a stable subatomic particle. The term plasmonics will be replaced with 'electromagnetic barrier'.

The pulse frequency flowing through the EM barriers of ‘most’ metals matches ultraviolet EM waves. Metals reflect most EM frequencies lower than x-ray and gamma ray, or ‘frequencies higher than ultraviolet are absorbed, or pass through most metals,’ just as visible light passes through glass. For alkali metals, gold, silver, and a few other materials, EM barriers operate at frequencies matching the wavelengths of visible or near-ultraviolet light. The frequencies of the EM barriers represent the resonance of the atoms’ electromagnetic/thermal fields.

When Electromagnetic Barriers (Plasmonic Fields) Meet

When the surfaces of two materials meet, an exchange of thermons takes place and, depending on the materials, and there may be a transfer of electrons. A thermons is a joined electron and positron, and in bulk, they transport light, represent dark matter, and within matter, are units of heat. Thermons are Maxwell Planck’s ‘oscillators’. The magnetic portion of the electromagnetic barrier is a determining resistance factor in the transfer of electrons, as is the difference in electrical charges (think static electricity). The EM barrier/field of insulators present a strong magnetic influence, while conductors present a strong electrical influence. Solar cells provide an example of reactions when two solid materials are pressed together.

Before going any further, I would like to change a technical term. The term pn junction is a leftover from times when electricity was described using a vacuum model. In that model, atoms were a negative vacuum, drawing the positive electrons in. The electron of those days was considered a positive, a reversal of the present day model. While it could be argued an electron hole is a vacuum, the historical misnomer ‘pn junction’ is confusing at best. Within the Ultra-Space Field Theory, and breaking with tradition, the pn junction shall, henceforth, be called the east-west junction per the East-West Geomagnetic effect.

Returning to solar cells, and using silicon solar cells as an example, the USF theory paradigm describes the typical photovoltaic process as follows:

Trace amounts of boron are added to pure silicon, forming the first layer of the solar cell, called an ‘eastern’ semiconductor. The surface layer of a photovoltaic cell is very thin and transparent, so light can be transported throughout the first layer. The east-west junction (‘east’ stands for negative charge and ‘west’ stands for positive charge) is where the first layer of silicon meets with the second layer of silicon. The second layer is called a ‘western’ semiconductor, and consists of pure silicon laced with phosphorus.

Silicon is neither a good conductor, nor a good insulator Silicon is classified as a semiconductor. The boron added to the first layer gives it a subtley negative/eastern charge, and the phosphorous added to the second layer gives it a subtlety positive/western charge. This alters each layers EM barrier, allowing loose and free electrons from the boron to pass through to the more positively charged phosphorous. The east-west junction behaves as a magnetic field layer, allowing electrons to pass in one direction with minimal resistance. These joined EM barriers provide a diode effect.

When light of certain frequencies passes into the eastern-layer, quanta are absorbed, shifting and expanding the thermal field. The thermal fields around the boron and silicon atoms expand pressing the orbiting electrons outward, increasing the number of free and loose electrons. The weakly bound boron electrons, already attracted to the phosphorous by coulombic attraction, are ejected per the photoemissive effect and thermal field pressures, and travel through the east-west junction to the western layer.

With light powering the release and transfer of electrons from the eastern side of the junction to the western, an excess of electrons develops in the western layer. The solar cell essentially becomes a generator. If an alternative path, or circuit, is installed to bypass the the diode effect of the EM barriers, a moving current is created which can be used as a power source. Electrons return to the eastern layer, only to be transported, once again through the EM barrier to the western barrier per solar pressures and electrical attraction.

In terms of mathematics and moving charges, modern industry models and the USF theory agree quite well. The paradigms are different, but the processes described are essentially the same. Typical light to electricity conversion efficiencies for solar cells currently average from 10 to 15 percent. Efficiencies of 30 percent have been achieved using gallium arsenide cells, and researchers hope eventually to reach as high as a 40 percent conversion rate.

Light/Matter Interactions (Transformations)

<u>Intro</u>

The EM barrier (plasmonic field) at the surface of a substance acts as a screen and dictates how differing EM pulses interact with the substance. Some frequencies of light are reflected, while others are transmitted into, or through, the matter. The thermal field surrounding atoms transports the EM pulses, or absorbs their kinetic energy, to be relaesed as heat.

Each atom has its own resonance, or vibrational pattern, which supports the resonance at the EM barrier. The resonance patterns become more complicated as the number of protons and neutrons at an atom's core, and orbiting electrons, increase. The USF Theory describes protons and neutrons in an atom as pseudo-neutrons, protons joined and neutralized by electrons. True neutrons exist very briefly, after leaving the atomic core, and then separate into a proton and electron. High pseudo-neutron counts take place in heavy elements, such as iron (56 pseudo-neutrons, with 30 internally shared electrons and 26 orbiting electrons) or zinc (65 pseudo-neutrons, sharing 35 electrons, with 30 electrons in orbit), or in complex molecules, such as the crystal calcite ($CaCO_3$, 100 pseudo-neutrons sharing 50 electrons and somwhere around 50 orbital electrons).

Metals reflect most EM frequencies, but not x-rays or gamma rays. These high frequencies will pass quanta through thin sheets of metal, though thicker sheets will absorb them. Quanta moving through thick sheets of metal can be absorbed by the dense thermal field surrounding atoms (becoming heat), or cause a thermon to split.

Reflection

Reflected light has become a very useful tool for life forms with eyes. Visible light reflects off objects at a wide range of frequencies, sending the eye vast amounts of information about our immediate surroundings.

Light can be reflected in a variety of ways. When reflected off a smooth surface, the EM pulses are being repulsed by the EM barrier. EM barrier repulsion can also take place using an irregular, bumpy surface, but this results in 'diffused reflection,' with the light scattering in different directions. Another form of diffused reflection is when quanta are reflected off molecules. The blue sky is a result of this kind of reflection.

Mirrors provide the most focused example of reflected light. Modern mirrors are made of a reflective metal coating on the back of a glass pane. Visible light is transmitted through the thermal field of the glass, repelled by the EM barriers of the metal, and again transmitted through the glass' thermal field and into the thermal field of the air before being received by our eyes.

There is some displacement of light waves as they transfer from the air, and through the surface of the glass, but this effect is reversed as the electromagnetic pulses are repelled back through the glass. The metal foil on the back of the glass is generally aluminum, which has an EM barrier resonance repelling visible light. The individual atoms are not arranged closely enough to be responsible for reflection. It is the foil's electromagnetic barrier that provides the smooth, reflective surface.

The glass pane is made primarily of melted silica, cooled so quickly crystals were not allowed to form. Crystal formations would alter the transparency of glass, creating blurred and distorted images. Each small crystal would have its own individual EM barrier resonance.

The EM barrier resonates at a certain frequency, repelling similar frequencies, while allowing lower and higher frequencies through. Lower EM frequencies are often absorbed after passing the initial EM barrier, while higher frequencies may pass through unaffected.

Absorption

Matter which is not pure white or transparent is absorbing visible light (and its quantum energy). The quantum energy shifts the thermons, creating heat. If an object is green (approx. 527 nm pulselength), then that frequency is being reflected while all other visible frequencies are being absorbed.

The color black is an absence of visible light. A black object is not reflecting visible light (though it will be radiating invisible infrared light). A black object is typically absorbing visible light and redirecting the kinetic energy into heat. Whether the object is made of a black material or simply coated with a black paint makes no difference. The pigment of the paint acts to absorb the light and transform it into heat.

Absorption takes place after light has entered the thermal field. The light is initially transmitted through the EM barrier and is altered by internal interference. Absorption is not a thermon splitting (or pair separation) process. Instead, the kinetic energy is absorbed in totality by the thermal field, most often as it approaches an atom or molecule, shifting and rearranging the condensed thermons. As an EM pulse approaches an atom, the thermal field becomes denser. This, in turn, causes the expanding pulse front to become funneled, or concentrated.

When quanta (an expression of kinetic energy) are absorbed, the total energy is a combination of frequency and intensity. In the case of infrared light, the pulse can push the electrons outward, transferring some of the kinetic energy. The electrons again shift inward, per their electron-positron attraction, and create new infrared light in the process. Higher frequencies, or more concentrated pulses (intensity), can cause the loss of outer valence electrons.

When an outer orbit electron is lost, the remaining electrons produce different EM frequencies during quantum jumps. The atom's magnetic field and the position of the remaining electrons also change.

Transmission

Transparent matter has EM barriers which allow certain light frequencies (specifically, visible light) to pass through. While visible light is not reflected, each frequency is deflected slightly as it passes through the EM barrier.

The denser the thermal field of the material (per gravmagnetic influence from the atomic cores), the more slowly the EM pulses pass through. EM frequency is also a factor, with higher frequencies traveling slower than lower, less energetic frequencies. This variation in speed, based on frequency, results in dispersion and refraction (the rainbow effect displayed by prisms).

Refraction

Accept for total reflection (an ideal), some quantum energy will pass through the surface of a material, though it may only penetrate to a short distance before being transformed into heat. For transparent materials, most of the visible light passes through. Visible light contains a range of pulselengths, and the *direction* of differing pulselengths passing through the the EM barrier is altered.

Using glass as an example, if light enters through a flat surface (EM barrier), each frequency follows a slightly different path. If the exit surface is parallel to the entry surface, the second EM barrier returns the varying frequencies to their original direction. If the surfaces are not parallel, as with a prism or a lens, the light takes a different direction as it passes through the second EM barrier.

The thickness of a material can have an effect as well. After passing through the first EM barrier of a piece of glass, higher frequencies move more slowly through the denser thermal field. Though all the frequencies may have entered at approximately the same location in a very thick piece glass they may exit at slightly different times. Normally, this is not noticeable on a small scale, but a prism will imitate and exaggerate the effect.

Polarization (Altered Pulse States)

Unpolarized Light

The traditional model of an EM pulse shows electric pulses traveling with a transverse up-down motion (similar to waves on the surface of water), and a magnetic pulses oscillating in synch from side to side. This image is based in part on a model of electric current, with the north/south magnetic alignment being at right angles to the flow of electricity, and in part on 'highly' polarized light.

Unpolarized light is made up of chaotic pulses. It is also an ideal. Most sources of light produce EM pulses that are at least weakly polarized, though very weakly polarized light can be treated as unpolarized. Additionally, light can be polarized quite easily by environmental factors.

Polarized Light

The polarization of light is generally described as the separation of light waves, based on their 'electrical' polar orientations. The USF theory describes the process as changing the EM pulse's compression dynamics. A polarized EM wavefront distorts the compression of a thermon, altering its magnetic and electric alignment to match those of the preceeding thermons. The more uniform these alterations are, the more the light is polarized. The electron-positron components of the compressed thermon express the distortion most clearly. More extreme forms of polarization produce some interesting results when interacting with matter.

Polarized light is generally considered to be EM pulses with uniform distortions. This type of uniformity can be caused in a variety of ways.

Reflection

The reflection of light can result in polarization. This process can happen when light strikes a nonmetallic surface at any angle other than 90 degrees. The amount of light polarized can vary from 100% to none at all. An angle producing 100% polarization is called the 'polarizing angle.' Light striking at certain angles is separated into two beams.

The polarizing angle for reflection varies with the type of material being used and its EM barrier. For glass, the polarizing angle is approximately 57 degrees. (This should not be confused with a 'reflected image.')

Each EM pulse contains some rhythmic distortions, with roughly 50% oriented to one side and the remaining 50% to the other side. At 57 degrees, the glass' EM barrier reflects half of the light with similar distortions off its surface, with the remaining half reflected into its thermal field where it passes through or is absorbed. Polarization can also take place through molecular reflection. Molecular reflection produces scattered light (as one might expect from a spherical reflector). An example of this is the blue sky we see on a sunny day. Blue frequencies of light from Sol are reflected and scattered by atmospheric molecules more readily than any other visible color because of their short pulselengths. Much of this light is polarized in the process (though scattered).

Crystal Polarization

Christian Huygens first worked with the phenomenon of polarized light in 1690, while experimenting with crystals, specifically Iceland spar (also known as calcite). Iceland spar grows into very large crystals and is easy to experiment with. He found aiming a beam of light through one of these crystals separated it into two beams of equal intensity (unless the light was aimed directly through its crystallographic axis).

Further experiments by Huygens showed if one of these beams were aimed through a second crystal, it, also, would divide into two beams of equal or unequal intensity, or not separate at all, depending on the orientation of the second crystal. From these experiments he first determined the polarization abilities of light. The molecules in crystals are arranged in uniform, regular patterns. Iceland spar, and many other forms of transparent or translucent crystals, have an internal pattern of layers, or walls of molecules. These molecular layers act as EM barriers and provide corridors for certain frequencies of light.

Light enters the thermal field of Iceland spar, but upon entry is separated into two beams. One beam of light is the result of 'internal reflection' and is channeled through the molecular corridors. This reflected beam is polarized. The remaining, unchanneled beam is not repelled by internal EM barriers and continues along its original path through the Iceland spar.

Some crystals, such as tourmaline, are called ‘dichroic’ and gradually absorb the unpolarized light, while the remaining polarized light passes through.

The channeled beam always follows the path of the molecular corridors, as demonstrated by a simple rotation experiment. As the crystal is rotated, the channeled beam moves with the crystal and continues to exit from the same location on the surface of the crystal. The unchanneled beam continues in a straight line path, unaffected by the rotation of the crystal.

Crystal polarization is a form of reflective polarization, but the reflection takes place inside the crystal instead of on its surface. Crystal polarization also shows the rhythmic patterns of EM pulses are involved in the reflection process and that uniform patterns can be introduced into light waves. There is a high probability *the thermons within the channels* have a uniform north/south polarization.

The Faraday Effect

Named after its discoverer, Michael Faraday, the Faraday effect (no longer mentioned in text books) is fast becoming a forgotten phenomenon, primarily because it is unexplainable using a particle theory paradigm. Magnetic polarization was originally used to explain this phenomenon, but moving electric fields provide a better explanation.

The Faraday effect is normally described as the rotation of a polarized light beam by an intense magnetic field as light passes through a medium. The USF theory, however, distinguishes between the strongly interlinked magnetic fields of permanent magnets and the temporary magnetic alignments formed by electric current. The ‘magnetic polarization’ described in Faraday’s experiment uses electric current.

Electric polarization is produced using a transparent, isotropic medium, such as leaded glass, surrounded by an electric coil. This model predicts the turning of polarized EM pulses as the result, not of a magnetic field, but of a moving electric field. As electrons move through the coiled conductor, their collective field radiation repels the eastern half of the thermons transporting the EM pulse, while attracting the western half. Loose thermons, and hence a portion of the EM pulse’s quantum energies, are rotated in the direction of the moving current.

R. M. Kiehn reached the same conclusion, separately and at an earlier date. In 1997, he presented a mathematical argument describing the implausibility of the Faraday effect being the result of magnetism. He carried his argument further by mathematically describing the Faraday effect as the result of moving electric fields.

The strength of the current and the length of the transparent medium both influence the amount of rotation. A stronger field, or a longer medium, (or both) will cause the amount of rotation to increase. The electric field generated by the coil creates a constant spiralling pressure on the already polarized light. As the light passes through the medium, the quantum energy and thermons rotate under the constant pressure of the moving electric field. The quanta being transported pass this kinetic pattern onto the thermons after leaving the glass.

Inverse Faraday Effect

There have been some unsuccessful efforts to assign a magnetic orientation to polarized light. This is, in part, based on the expectation of an Inverse Faraday effect, with circularly polarized light producing a magnetic field. Experiments using lasers have shown circularly polarized lasers can cause a Faraday effect in test beams interacting with the laser. There have been, however, no direct measurements, nor any evidence, of an increased magnetic field to show an *Inverse* Faraday effect.

1. 'The Ultra-Space Field Theory', K. Foote, Cosmos Books, Ann Arbor, 2005.