Surface

Robert William Whitby
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http://homepage.mac.com/whitby/

http://web.me.com/whitby/Octahedron/Welcome.html

Reference

Octahedron1stEd.pdf–bookmark SURFACE–pages 463-470

Introduction

This material is excerpted from *Octahedron*. It shows the relationships between cfu as photon and cfu as thermal oscillator at a material surface. The phenomena–which are characterized as light, electricity, or heat–derive from the motions of materail particles and the momentum exchanges between them.

SURFACE

The nature of a surface

A surface of a crystal is defined by topological features of the epns of the atoms of the outermost cfus. The cfus are thermally in motion. The position of a cfu varies in time in three dimensions. Its velocity varies in the same three dimensions. Its inertia is composed of its motion and the polar interactions of the edges of the epns of which its atoms are composed.

The atom or group of atoms which comprise a photon collides not with a *surface* but with one or more of the outermost cfus which constitute the body.

Polishing: metallographic specimen. In each of the above drawings, the upper perimeter represents a sectional profile of a stage in the preparation of a metal specimen for examination by an optical microscope. The specimen is cut from a larger coupon by a saw. The saw produces grooves which are represented by the top drawing. These are abraded away by a coarse grit. Which results in the topography of the second drawing. A finer grit is applied at right angles until the grooves of the coarse grit are removed. The resulting typography is indicated in the third drawing. The process of applying successively finer grits at right angles to remove the grooves of the previous grits is indicated by the next three drawings. The process is complete when the grooves of the final grit are not optically detectable at the desired magnification.

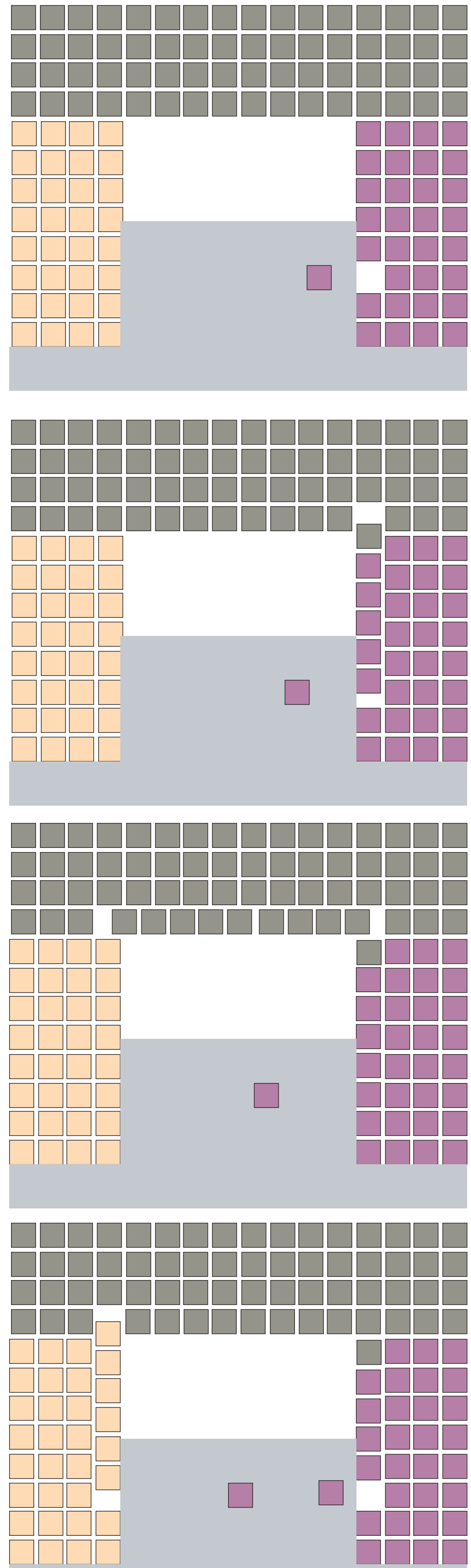
Polishing a metallographic specimen

Optically examining a stainless steel specimen on a metallograph requires a "smooth surface". The specimen is cut from a bar with a saw. The saw marks are then removed by applying a coarse grit in a given direction which produces uniform grooves.The specimen is then rotated 90° to the previous sanding direction and a finer grit is applied until all traces of the markings of the previous grit have been removed. The process continues using successively finer grits until there are no optically detectable grooves.

In the figure on the right, each of the topographical representations of the specimen is a "surface". The polishing method is to take a rough surface and smooth it. For a given area, the height of the peaks is reduced as is the width. There are more peaks per length.

Electrolysis

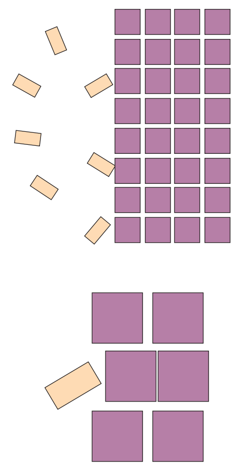
One electrode of an electrolytic cell is etched by the electrolyte—cfus of the electrode enter the electrolyte with their thermal momentum and leave a void in the thermal structure of the electrode. This disrupts the thermal motions of the adjoining cfus and this, in turn, disrupts the motions of those cfus which adjoin them. In this manner, the disruption is propagated through the electrode to the circuit connecting it to the opposing electrode.



Electrolysis

Kinetic theory

Kinetic theory treats the inner surface of a container of gas as a continuum. It speaks of the gas molecule striking the surface. But the surface is not a continuum. It is composed of cfus which are in thermal motion. It is a cfu that is struck by a gas molecule. The gas molecule comes to rest relative to the cfu which it strikes. It is then accelerated to a velocity in a direction which is opposite to its approach direction. When the container cfu and the gas molecule have the same temperature, the restored velocity of the gas molecule is equal to its pre-collision velocity.



Momentum exchange: Gas molecule-surface cfu.

The top drawing represents gas molecules in the vicinity of a container surface which is represented by a rectangular array of squares. Below it, the effect of the collision of a gas molecule with a cfu of the container is shown in an enlargement.

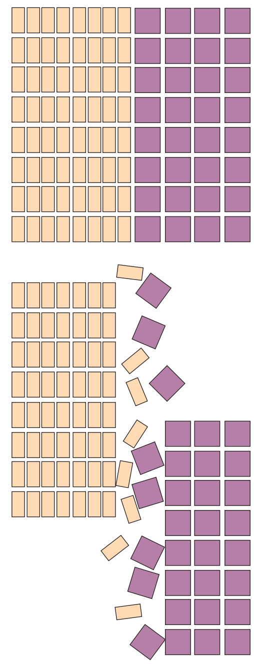
Friction between surfaces

Static electricity

Static electricity is produced by relative motion between the surfaces of two bodies which are in contact. The motion dislodges cfus from each of the bodies. Each dislodged cfu is free of the structural constraints of the other cfus of the body from which it came. The dislodged cfus are attracted to the bodies but are jostled by one another and are spread apart by their disjointed relative motions. The dislodged cfus orient to conform to the ambient polar influences.

Surface wear

The physical removal of cfus from the surfaces of bodies in contact is termed surface wear. The mechanism of removal is the same as for the production of static electricity. The cfus of one body are dislodged by the cfus of the other body. Over time, the loss of material becomes apparent through a change in the appearance of the surface.



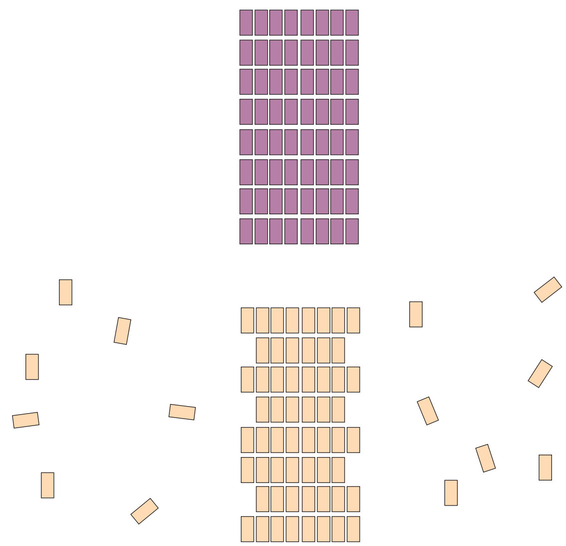
Static electricity.
Two bodies in contact are depicted at the top of the figure. The effect of relative motion between the bodies is shown below. The cfus of the contacting surfaces are being dislodged and are disoriented and free of the structural constraints of the bodies. These are the “charge”.

Thermal emission

Lamp filament

The surface cfus of the lamp filament acquire momentum which is sufficient to overcome the polar attractions of the adjoining cfus which constitute the filament. The momentum of the cfu determines the character of its effect on other cfus which it contacts. The escaped cfus of the filament are termed "photons" or "electrons" depending upon the observed effects.

In the figure, the top array of rectangles represent the cfus of the cold filament. Below it, the filament is heated to the point that its surface cfus are freed and have become detectable as "radiation".

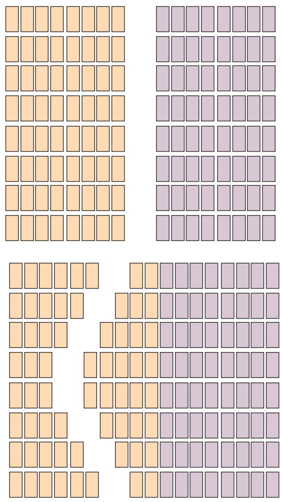


Lamp filament.
The upper rectangular array represents an unheated lamp filament. Below it, the filament is heated to incandescence and emits the cfus of which it is composed. The emitted cfus are the photons and constitute the emitted radiation.

Blackbody radiation

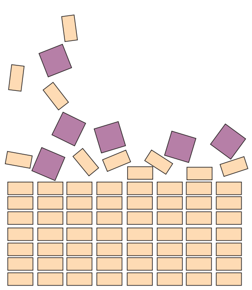
Because radiation was fallaciously thought to be in the form of a "wave", it was thought that the thermal equilibrium within a blackbody was due to a balance between "energy emission" and "energy absorption." The true situation is analogous to the momentum exchange between the molecules of a gas and the cfus of the gas container's surface. *See* "Kinetic theory" on page 466

Ignition breaker points



Ignition breaker points.
At the top are representations of a pair of breaker points before use. At the bottom, the typical cup erosion and cone deposition is depicted. The cfus of one of the points carry the momentum of the electrical discharge to the opposite point.

Photoelectric effect



Photoelectric effect.
The cfus (violet) which constitute the photons collide with the cfus (yellow) which constitute the metal dislodging them. The dislodged cfus are the "electrons".

X-ray tube

The x-ray tube accelerates the cfus emitted by a heated filament towards a metal plate which is called a target. As in the photoelectric effect, the filament cfus collide with the target cfus and dislodge them. The dislodged cfus are the x-ray photons.

Photon-cfu collision

In addition to the undisturbed thermal motion, there is the modification caused by the collisions with the atoms or groups of atoms which constitute the photons. These disturbances are transmitted throughout the crystal. The photon may be rotated with respect to its neighboring photons and this rotation may affect the resulting collision with the cfu. It is this variation with time which causes the collision of a given photon to differ with the collision of a similar photon at the same *place*. One photon encounters a given cfu when the cfu is moving towards the body; another cfu encounters the same cfu when it is moving away from the body. The vagaries of the these encounters result in reflection in one instance and refraction in another.

Reflection

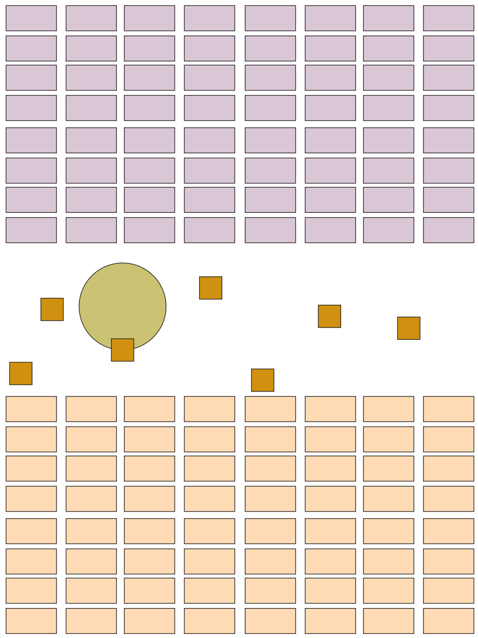
The photon collides with a cfu and gives up the component of its velocity which is normal to the surface and the recoil restores it.

Refraction

The momentum of the photon must be absorbed by the cfu and its neighbors and restored to the photon during the recoil. The greater the momentum the longer the time for the absorption and the longer the time for the recoil. The multiple photon-cfu collisions which constitute the passage of the photon through the crystals increase the passage time. This time is directly proportional to the entering momentum of the photon.

Millikan oil drop experiment

Millikan observed the motions of droplets of



oil between metal plates which were attached to a battery. He noted sudden incremental changes in the momentum of the oil droplets which were in a common direction relative to which plate was attached to which battery terminal. The space surrounding the oil drops was filled with the molecules which constitute air. These molecules are propelled perpendicularly from the plate whose cfus have a higher momentum. Some of these molecules collide with the oil drop and cause the observed accelerations. In the figure, the plate which is composed of cfus of higher momentum is below the oil drop. The squares represent the molecular constituents of air. The circle is the oil droplet. The molecules which collide with the upper plate cfus lose the momentum they acquired from collisions with the lower plate cfus.