IONIC CONDUCTION

The purpose of this document is to teach lay persons, about some of the intricacies of physics, electronics. They are taken for granted, when we use some of the marvelous inventions, which make our lives easier. Case in point, the MICROWAVE oven.

Definitions:

The terms used in this paper shall have the following meanings (unless otherwise expressly provided herein)

IONS, generally are known as a cohesive group of atoms, in any material, containing EITHER, a positive or negative charge.

IONIC CONDUCTION consists of the movement of IONS, (a group of ATOMS of either positive or negative charge), hopping/moving, from one site to another, generally classified as "ION-HOPPING", in the lattice(s), of any material, via "point defects", called "vacancies".

"Point defects", exist, where an atom is missing or is in an irregular place, in a lattice structure.

A Lattice is defined, as the composition of the internal sections of any material, arranged like a trellis, (upon which vines grow). There are many existing, different directions/sections/layers, (lattices), in all materials, depending on the atomic composition of the material in question.

"Vacancies" are empty spaces in any material/structure, where an atom should be, but is missing. They are common, especially at high temperatures, where atoms frequently and randomly, change their positions, leaving behind empty lattice sites. In most cases, diffusion, (mass transport by atomic motion), can ONLY occur, because of vacancies.

NOTE: "Vacancies", heretofore, similarly discussed in electronics, were addressed as "Holes", [absent of any electrical charge], in any material, (empty spots between positive and negatively-charged particles).

Radio Frequency (R F) waves, are alternating-current electrical signals, used to produce and detect electrical signals, (radio waves), in/through, the air. The frequency rate, (signals going from left –to-right, then going from right-to-left), can cause/effect work/output, by and in, electrical equipment. R. F. signals may also cause work to be done, in NON-electrically connected equipment, such as a kitchen Microwave oven/Radar/ Bombarder/T.V. Set/ MRI's, etc.

Generally the signals may range from (3) cycles per second (3 Hz) to 300 Billion cycles per second (3 GHz). Since most of this range is beyond the vibration rate that most mechanical systems can respond to, they generally refer to oscillations, (back and forth), in electrical circuits or electro-magnetic radiation.

At normal ambient operating temperatures, very little ion-hopping takes place, since the atoms are at relatively low energy states. Ion-hopping, refers to Ions moving in coordinated fashion, toward the next vacancy. As temperatures, go higher, Ions seeking vacancies, become MORE mobile, generating even MORE heat, etc.

Radio-frequency, (R. F.) waves, causes rapid changes of electrically-charged particles. These particles are attempting to re-align themselves, into North to South alignments, from the directional frequency changes, caused by the constant frequency shift, of (R.F.) waves

Assume microwaves at (30 KHz), 30,000 times a second. The left/right, right/left, transmitted waves, creates "friction", because the particles rub against one another! These rapid re-alignment, (friction-causing), move - ments, reacting to the (R. F.) Wave bombardment causes the material to be heated.

The hotter the material gets, the MORE rapidly the Ions move, causing a run-a-way increase of temperature. As the (R. F.) continues its assault, on the material being bombarded, that material goes into its melting point. If the (R.F.) is NOT terminated, the material may go even further yet, … into a cloud of particles …. or … even gas, (plasma) !

NOTE: Even "micro-wavable" containers ARE subject to this effect, over the long-term, (after several hours of exposure). But for ordinary home-cooking use, minutes, an hour, the containers appear, NOT, to be unduly affected.

The foregoing, is an explanation, why certain materials (insulators), may actually be impacted by (R.F.) waves, when normally, over the short term, the insulating materials appear, NOT, to be affected.

That lends credence, to the fact, that ALL materials conduct electricity, but some are LESS able to do so. This proves, there is NO electrical insulator, which is 100 % effective!