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Study Of Microwave's Applications

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Abstract: The aim of this research paper is to discuss the advantages and disadvantages of microwaves. Microwaves are a form of electromagnetic radiation with wavelengths ranging from as long as one meter to as short as one millimeter, or equivalently, with frequencies between 300 MHz (0.3 GHz) and 300 GHz. In this paper uses, sources, applications and effects on human health are discussed and the final argument is drawn. The aim of this research paper is to discuss the advantages and disadvantages of microwaves. Microwave energy based chemical synthesis has several merits and is important from both scientific and engineering standpoints. Microwaves have been applied in numerous inorganic and organic chemical syntheses; perhaps, from the time their ability to work as heat source was discovered. Recent laboratory scale microwave applications in biodiesel production proved the potential of the technology to achieve superior results over conventional techniques. Short reaction time, cleaner reaction products, and reduced separation-purification times are the key observations reported by many researchers. Energy utilization and specific energy requirements for microwave based biodiesel synthesis are reportedly better than conventional techniques. Microwaves can be very well utilized in feedstock preparation, extraction and trans esterification stages of the biodiesel production process. Although microwave technology has advanced in other food, pharmaceutical and polymer chemistry related research and industry, it has yet to prove its potential in the biodiesel industry at large scale applications. In this paper uses, sources, applications and effects on human health are discussed and the final argument is drawn.

Introduction

The aim of writing this research paper is to study the pros and cons of microwaves and its effects on human health and its various applications in different fields. In deciding how to organize the information relevant to microwaves, I looked at the process of developing new methods. Within each part of this process, I have tried to optimize the format for each table to convey the information in a concise yet accessible manner.[1]

A. Brief description on microwaves:

Microwaves are a form of electromagnetic radiation with wavelengths ranging from as long as one meter to as short as one millimeter, or equivalently, with frequencies between 300 MHz (0.3 GHz) and 300 GHz. This broad definition includes both UHF and EHF (millimeter waves), and various sources use different boundaries. In all cases, microwave includes the entire SHF band (3 to 30 GHz, or 10 to 1 cm) at minimum, with RF engineering often putting the lower boundary at 1 GHz (30 cm), and the upper around 100 GHz (3 mm). The prefix "micro-" in "microwave" is not meant to suggest a wavelength in the micrometer range. It indicates that microwaves are "small" compared to waves used in typical radio broadcasting, in that they have shorter wavelengths. The boundaries between far infrared light, terahertz radiation, microwaves, and ultra-high-frequency radio waves are fairly arbitrary and are used variously between different fields of study.[1]
Microwave technology is extensively used for point-to-point telecommunications (i.e., non broadcast uses). Microwaves are especially suitable for this use since they are more easily focused into narrower beams than radio waves, allowing frequency reuse; their comparatively higher frequencies allow broad bandwidth and high data transmission rates, and antenna sizes are smaller than at lower frequencies because antenna size is inversely proportional to transmitted frequency. Microwaves are used in spacecraft communication, and much of the world's data, TV, and telephone communications are transmitted long distances by microwaves between ground stations and communications satellites. Microwaves are also employed in microwave ovens and in radar technology.[2]
Beginning at about 40 GHz, the atmosphere becomes less transparent to microwaves, due at lower frequencies to absorption from water vapor and at higher frequencies from oxygen. A spectral band structure causes absorption peaks at specific frequencies. Above 100 GHz, the absorption of electromagnetic radiation by Earth's atmosphere is so great that it is in effect opaque, until the atmosphere becomes transparent again in the so-called infrared and optical window frequency ranges.[2]

B. Microwave sources:

High-power microwave sources use specialized vacuum tubes to generate microwaves. These devices operate on different principles from low-frequency vacuum tubes, using the ballistic motion of electrons in a vacuum under the influence of controlling electric or magnetic fields, and include the magnetron (used in microwave

ovens), klystron, traveling-wave tube (TWT), and gyrotron. These devices work in the density modulated mode, rather than the current modulated mode. This means that they work on the basis of clumps of electrons flying ballistically through them, rather than using a continuous stream of electrons.[3]

Low-power microwave sources use solid-state devices such as the field-effect transistor (at least at lower frequencies), tunnel diodes, Gunn diodes, and Low-power sources are available as bench top instruments, rack mount instruments, embeddable modules and in card-level formats. A maser is a solid state device which amplifies microwaves using similar principles to the laser, which amplifies higher frequency light waves.[3]

I. Uses

A. Communication

Before the advent of fiber-optic transmission, most long-distance telephone calls were carried via networks of microwave radio relay links run by carriers such as AT&T Long Lines. Starting in the early 1950s, frequency division multiplex was used to send up to 5,400 telephone channels on each microwave radio channel, with as many as ten radio channels combined into one antenna for the hop to the next site, up to 70 km away.[2]
Wireless LAN protocols, such as Bluetooth and the IEEE 802.11 specifications, also use microwaves in the 2.4 GHz ISM band, although 802.11a uses ISM band and U-NII frequencies in the 5 GHz range. Licensed long-range (up to about 25 km) Wireless Internet Access services have been used for almost a decade in many countries in the 3.5–4.0 GHz range.

Metropolitan area network (MAN) protocols, such as WiMAX (Worldwide Interoperability for Microwave Access) are based on standards such as IEEE 802.16, designed to operate between 2 to 11 GHz. Commercial implementations are in the 2.3 GHz, 2.5 GHz, 3.5 GHz and 5.8 GHz ranges.[4]
Mobile Broadband Wireless Access (MBWA) protocols based on standards specifications such as IEEE 802.20 or ATIS/ANSI HC-SDMA (such as iBurst) operate between 1.6 and 2.3 GHz to give mobility and in-building penetration characteristics similar to mobile phones but with vastly greater spectral efficiency.[2]

B. Radar

Radar uses microwave radiation to detect the range, speed, and other characteristics of remote objects. Development of radar was accelerated during World War II due to its great military utility. Now radar is widely used for applications such as air traffic control, weather forecasting, navigation of ships, and speed limit enforcement.[3]
A Gunn diode oscillator and waveguide are used as a motion detector for automatic door openers.

C. Navigation

Global Navigation Satellite Systems (GNSS) including the Chinese Beidou, the American Global Positioning System (GPS) and the Russian GLONASS broadcast navigational signals in various bands between about 1.2 GHz and 1.6 GHz.[4]

D. Heating and power application

A microwave oven passes (non-ionizing) microwave radiation (at a frequency near 2.45 GHz) through food, causing dielectric heating primarily by absorption of the energy in water. Microwave ovens became common kitchen appliances in Western countries in the late 1970s, following development of inexpensive cavity magnetrons. Water in the liquid state possesses many molecular interactions that broaden the absorption peak. In the vapor phase, isolated water molecules absorb at around 22 GHz, almost ten times the frequency of the microwave oven.[12] Microwave heating is used in industrial processes for drying and curing products.[13] Microwaves can be used to transmit power over long distances, and post-World War II research was done to examine possibilities. NASA worked in the 1970s and early 1980s to research the possibilities of using solar power satellite (SPS) systems with large solar arrays that would beam power down to the Earth's surface via microwaves.[4]

II. Microwave Frequency Bands

The microwave spectrum is usually defined as electromagnetic energy ranging from approximately 1 GHz to 100 GHz in frequency, but older usage includes lower frequencies. Most common applications are within the 1 to 40 GHz range. One set of microwave frequency bands designations by the Radio Society of Great Britain (RSGB).[10]

III. Microwave Frequency Measurement

Microwave frequency can be measured by either electronic or mechanical techniques.
Frequency counters or high frequency heterodyne systems can be used. Here the unknown frequency is compared with harmonics of a known lower frequency by use of a low frequency generator, a harmonic generator and a mixer. Accuracy of the measurement is limited by the accuracy and stability of the reference source. Mechanical methods require a tunable resonator such as an absorption wavemeter, which has a known relation between a physical dimension and frequency.[11]

IV. Effects on Health

Microwaves do not contain sufficient energy to chemically change substances by ionization, and so are an example of non-ionizing radiation. The word "radiation" refers to energy radiating from a source and not to radioactivity. It has not been shown conclusively that microwaves (or other non-ionizing electromagnetic radiation) have significant adverse biological effects at low levels. Some, but not all, studies suggest that long-term exposure may have a carcinogenic effect. This is separate from the risks associated with very high intensity exposure, which can cause heating and burns like any heat source, and not a unique property of microwaves specifically.[2]

When injury from exposure to microwaves occurs, it usually results from dielectric heating induced in the body. Exposure to microwave radiation can produce cataracts by this mechanism, because the microwave heating denatures proteins in the crystalline lens of the eye (in the same way that heat turns egg whites white and opaque). The lens and cornea of the eye are especially vulnerable because they contain no blood vessels that can carry away heat. Exposure to heavy doses of microwave radiation (as from an oven that has been tampered with to allow operation even with the door open) can produce heat damage in other tissues as well, up to and including serious burns that may not be immediately evident because of the tendency for microwaves to heat deeper tissues with higher moisture content.[5]

V. Microwave Oven

In short, microwaves distort the molecular structure of the foods. They destroy much of the nutrients and cause many other problems with the immune system over a period of time.

A. Principle of working

Microwaves are a form of electromagnetic energy, like light waves or radio waves, and occupy a part of the electromagnetic spectrum of power, or energy. Microwaves are very short waves of electromagnetic energy that travel at the speed of light (186,282 miles per second). In our modern technological age, microwaves are used to relay long distance telephone signals, television programs, and computer information across the earth or to a satellite in space. But the microwave is most familiar to us as an energy source for cooking food.[6] Every microwave oven contains a magnetron, a tube in which electrons are affected by magnetic and electric fields in such a way as to produce micro wavelength radiation at about 2450 Mega Hertz (MHz) or 2.45 Giga Hertz (GHz). This microwave radiation interacts with the molecules in food. All wave energy changes polarity from positive to negative with each cycle of the wave. In microwaves, these polarity changes happen millions of times every second. Food molecules - especially the molecules of water - have a positive and negative end in the same way a magnet has a north and a south polarity.[7]

In commercial models, the oven has a power input of about 1000 watts of alternating current. Many terms are used in describing electromagnetic waves, such as wavelength, amplitude, cycle and frequency:

- Wavelength determines the type of radiation, i.e. radio, X-ray, ultraviolet, visible, infrared, etc.
- Amplitude determines the extent of movement measured from the starting point.
- Cycle determines the unit of frequency, such as cycles per second, Hertz, Hz, or cycles/second.
- Frequency determines the number of occurrences within a given time period (usually 1 second);
- the number of occurrences of a recurring process per unit of time, i.e. the number of repetitions of cycles per second.

Radiation = spreading energy with electromagnetic waves

Radiation, as defined by physics terminology, is "the electromagnetic waves emitted by the atoms and molecules of a radioactive substance as a result of nuclear decay." Radiation causes ionization, which is what occurs when a neutral atom gains or loses electrons. In simpler terms, a microwave oven decays and changes the molecular structure of the food by the process of radiation. Had the manufacturers accurately called them "radiation ovens", it's doubtful they would have ever sold one, but that's exactly what a microwave oven is.

VI. The Proven Dangers of Microwaves

Over 90% of American homes have microwave ovens used for meal preparation. Because microwave ovens are so convenient and energy efficient, as compared to conventional ovens, very few homes or restaurants are without them. In general, people believe that whatever a microwave oven does to foods cooked in it doesn't have any negative effect on either the food or them. Of course, if microwave ovens were really harmful, our government would never allow them on the market, would they? Would they? Regardless of what has been "officially" released concerning microwave ovens, we have personally stopped using ours based on the research facts outlined in this article.

The purpose of this is to show proof - evidence - that microwave cooking is not natural, nor healthy, and is far more dangerous to the human body than anyone could imagine. However, the microwave oven manufacturers, Washington City politics, and plain old human nature are suppressing the facts and evidence. Because of this, people are continuing to microwave their food - in blissful ignorance - without knowing the effects and danger of doing so.[5]

VII. Microwaved blood kills patient

It's very obvious that this form of microwave radiation "heating" does something to the substances it heats. It's also becoming quite apparent that people who process food in a microwave oven are also ingesting these "unknowns".
Because the body is electrochemical in nature, any force that disrupts or changes human electrochemical events will affect the physiology of the body. This is further described in Robert O. Becker's book, The Body Electric, and in Ellen Sugarman's book, Warning, the Electricity Around You May Be Hazardous to Your Health.

VIII. Scientific evidence and facts

In Comparative Study of Food Prepared Conventionally and in the Microwave Oven, published by Raum & Zelt in 1992, at 3(2): 43, it states "A basic hypothesis of natural medicine states that the introduction into the human body of molecules and energies, to which it is not accustomed, is much more likely to cause harm than good. Microwaved food contains both molecules and energies not present in food cooked in the way humans have been cooking food since the discovery of fire. Microwave energy from the sun and other stars is direct current based. Artificially produced microwaves, including those in ovens, are produced from alternating current and force a billion or more polarity reversals per second in every food molecule they hit. Production of unnatural molecules is inevitable. Naturally occurring amino acids have been observed to undergo isomeric changes (changes in shape morphing) as well as transformation into toxic forms, under the impact of microwaves produced in ovens.[8]

IX. Who invented microwave ovens?

The Nazis, for use in their mobile support operations, originally developed microwave "radiomissor" cooking ovens to be used for the invasion of Russia. By being able to utilize electronic equipment for preparation of meals on a mass scale, the logistical problem of cooking fuels would have been eliminated, as well as the convenience of producing edible products in a greatly reduced time-factor. Other Eastern European scientists also reported the harmful effects of microwave radiation and set up strict environmental limits for their usage. [9]

X. Carcinogens in microwaved food

In Dr. Lita Lee's book, Health Effects of Microwave Radiation - Microwave Ovens, and in the March and September 1991 issues of Earthletter, she stated that every microwave oven leaks electro-magnetic radiation, harms food, and converts substances cooked in it to dangerous organ-toxic and carcinogenic products. The following is a summary of the Russian investigations published by the Atlantis Raising Educational Center in Portland, Oregon. Carcinogens were formed in virtually all foods tested. No test food was subjected to more microwaving than necessary to accomplish the purpose, i.e., cooking, thawing, or heating to insure sanitary ingestion. Here's a summary of some of the results:

- Thawing frozen fruits converted their glucoside and galactoside containing fractions into carcinogenic substances.
- Extremely short exposure of raw, cooked or frozen vegetables converted their plant alkaloids into carcinogens.
- Carcinogenic free radicals were formed in microwaved plants, especially root vegetables. Decrease in nutritional value.[7]

XI. Microwave sickness is discovered

In Robert O. Becker's book, The Body Electric, he described Russian research on the health effects of microwave radiation, which they called "microwave sickness." On page 314, Becker states:
"It's [Microwave sickness] first signs are low blood pressure and slow pulse. The later and most common manifestations are chronic excitation of the sympathetic nervous system [stress syndrome] and high blood pressure.[6]
This phase also often includes headache, dizziness, eye pain, sleeplessness, irritability, anxiety, stomach pain, nervous tension, inability to concentrate, hair loss, plus an increased incidence of appendicitis, cataracts, reproductive problems, and cancer. The chronic symptoms are eventually succeeded by crisis of adrenal exhaustion and ischemic heart disease [the blockage of coronary arteries and heart attacks]." [5]
The symptoms of blood chemistries can easily be caused by the observations shown below. The following is a sample of these changes:

- Lymphatic disorders were observed, leading to decreased ability to prevent certain types of cancers.
- An increased rate of cancer cell formation was observed in the blood.
- Increased rates of stomach and intestinal cancers were observed.
- Higher rates of digestive disorders and a gradual breakdown of the systems of elimination were observed.

XII. Microwave Research Conclusions

In most cases, the foods used for research analysis were exposed to microwave propagation at an energy potential of 100 kilowatts/cm3/second, to the point considered acceptable for sanitary, normal ingestion. The effects noted by both German and Russian researchers are presented in three categories:

Category I, Cancer-Causing Effects
Category II, Nutritive Destruction of Foods
Category III, Biological Effects of Exposure

CATEGORY I
CANCER-CAUSING EFFECTS

1. Creation of a "binding effect" to radioactivity in the atmosphere, thus causing a marked increase in the amount of alpha and beta particle saturation in foods;
2. Creation of cancer causing agents within protein hydrolysate compounds in milk and cereal grains [*these are natural proteins that are split into unnatural fragments by the addition of water];
3. Alteration of elemental food-substances, causing disorders in the digestive system by unstable catabolism* of foods subjected to microwaves. [8]

CATEGORY II
DECREASE IN FOOD VALUE

Microwave exposure caused significant decreases in the nutritive value of all foods researched. The following are the most important findings:

1. A decrease in the bioavailability [capability of the body to utilize the nutriment] of B-complex vitamins, Vitamin C, Vitamin E, essential minerals and lipotropics in all foods;
2. A loss of 60-90% of the vital energy field content of all tested foods;
3. A destruction of the nutritive value of nucleoproteins in meats;
4. A marked acceleration of structural disintegration in all foods.

CATEGORY III
BIOLOGICAL EFFECTS OF EXPOSURE

Exposure to microwave emissions also had an unpredictably negative effect upon the general biological welfare of humans. This was not discovered until the Russians experimented with highly sophisticated equipment and discovered that a human did not even need to ingest the material substance of the microwaved food substances: that even exposure to the energy-field itself was sufficient to cause such adverse side effects that the use of any such microwave apparatus was forbidden in 1976 by Soviet state law.[6]

The following are the enumerated effects:

1. A breakdown of the human "life-energy field" in those who were exposed to microwave ovens while in operation, with side-effects to the human energy field of increasingly longer duration;

2. A degeneration of the cellular voltage parallels during the process of using the apparatus, especially in the blood and lymphatic areas;
3. A degeneration and destabilization of the external energy activated potentials of food utilization within the processes of human metabolism;

A degeneration and destabilization of internal cellular membrane potentials while transferring catabolic [metabolic breakdown] processes into the blood serum from the digestive process.

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