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Research Article

Deepening Researches on Infrared Rays Principles, Applications and Products

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Abstract: Objective: figuring out advantages and applications of infrared rays system in hospitals, at home and in industry.

Methodology: we mainly use in the study is empirical research and practices and experiences in infrared rays system applications in emerging markets such as Vietnam.

In the research we specify advantages of infrared rays products such as LEDs emitting infrared, sensor infrared, water filtration, etc.

Moreover, we identify there are more infrared application sin industry and manufacturing needed to be research.

Finally, we propose recommendations for infrared ray new product development in future in the context of industry 4.0 and further.

Keywords: Principles of Operation, Infrared Ray Applications, Product Advantages, Techniques, Infrastructure.

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1. Introduction

In this study we make analysis in more details on principles, applications and products of infrared rays.

Chieu (2007) stated that a spectrometer with imaging (infrared) functions as a device which could help to record spectroscopic (infrared) and sample spatial data.

Then, Prieto et al (2017) specified that spectroscopy (infrared near, NIR) has increasing demand because it is rapid and friendly to environment and can predict quality of meat. The paper organized with introduction, research questions, literature review, methodology, main results, discussion and conclusion.

Research Questions

Question 1: what are advantages of applications of infrared products?

Question 2: what are recommendations for infrared ray product development?

2. Literature Review

Bec et al (2020) stated that spectrometers (NIR applications) has evolution into some applications in past years. It is applied in a range from food to agriculture and to material and industry.

We summarize previous studies in the below table:

Table 1. Summary of relating previous studies on infrared rays

Authors	Year	Results, contents
Edwards and Bruemmer	1959	More than 99% is a ratio that radiation (infrared) with mirror reflects from regions of infrared near to far.
Kushel	1985	Rays (infrared) with radiation transmitted for artifacts examination able to image and paintings.
Sood et al	2009	A communication system will support smart grid to have impacts on system of electric power, in many aspects.
Jaber et al	2012	In order to reduce WiMAX connections (simultaneous), they propose DSRC - i.e. Dedicated Short-Range Communications (DSRC).
Cristiano	2019	Diseases or muscle can be treated with applications of rays (infrared) on tissues with length of wave (7800-1000μm).
Hoang Van Thuc, Dinh Tran Ngoc Huy, Doan Thi Thanh Thao, Nguyen Thi Phuong Thanh, Nguyen Ngoc Thach	2020	Data can be transmitted via a system with infrared rays that is quick, safe and low or cost saving.

3. Methodology and Data

Methods that authors use is empirical research and practices and experiences in infrared rays system applications in emerging markets such as Vietnam.

Authors also analyze previous studies to make comparison and references.

4. Main Results

4.1. Principles of Infrared Rays Products

Stoves (Infrared)

Since the infrared stove will heat according to the area of the coil, you need to choose an infrared stove with a cooking zone structure of 2-3 heat rings such as Chefs infrared stove, Giovani infrared stove, Fagor infrared stove. to use a large heat ring for large pots and pans and small heat rings for small pots and pans. The temperature of the wires ranges from 250 degrees C to 600 degrees C, just as the sun emits light and heat through space. This is enough to cook all kinds of different foods, with quick and effective cooking times helping you. Because the stove works by a heating mechanism that transfers heat from the glass to the main kitchen utensils, so the stove can use all kinds of pots.

Most of today's infrared stoves are used electronic components, glass surfaces imported from Germany such as:

Glass schott: is the most advanced glass on the market today used for high-end stoves. This glass has properties such as:

- High heat resistance and low thermal conductivity up to 1000ºC.
- Resistance to heat shock up to 800ºC (can be tested with ice pouring on glass while boiling).

Especially, this Schott Ceran glass surface is made of insulating glass ceramic material and this glass ceramic material, when broken, will not create small pieces so it does not cause damage to the user. In other words, this type of glass is safe for users, does not cause burns and does not occur electric shock for the user.

Infrared Sensor

The operating principle of the infrared sensor is also quite simple. When an animal or human walks past the device, a signal will appear, which will be picked up by the sensor and fed into the processing circuit to act as control or alarm.

Based on that principle, scientists have an idea of an infrared sensor, which can be controlled according to a moving body temperature, also known as a motion sensor.

4.2. Other Applications

Infrared Emitting LED HIR333C-H0

LED (infrared applications with length of wave 850nm), functions a semiconductor, for instance HIR333C-H0 can generate light, and some kinds in various colors.

Figure 1. Led emitting infrared HIR333C-H0

Hospitals Infrared Rays Applied

Far infrared rays are widely used in our daily life, especially in the field of medicine. Since the end of the twentieth century, far infrared rays have been widely used in the construction of heating systems and medicine. Applications of infrared rays in life and medicine such as: supportive treatment, prevention of malignant cancer, treatment of secretory diseases, relieve shoulder pain, support treatment of respiratory diseases, Many applications in the beauty and treatment of dermatological diseases.

5. Discussion

There are other applications of infrared rays system for instance:

The Application of Infrared Rays in Water Filtration

In daily drinking water treatment, far infrared rays are applied to the production of far infrared functional filter cores. In most Karofi household RO water purifiers, the far infrared filter element is installed at position 7, 8 or 9. These cores are made of ceramic ball particles that can the ability to absorb heat from the outside to create far infrared rays to split water molecules, increases activation, increases the absorption of water molecules and mineral ingredients are added in country. This far infrared filter has a lifespan of 12-24 months, depending on the level of usage as well as the quality of your family's water input.

Berzaghi and Riovanto (2016) pointed spectroscopy that is vibrational with the use of NIR radiation (750 - 2500nm) and it has many strengths such as without chemicals, samples minimum, working applicable, etc. NIR spectroscopy for animal products also used to decide elements or components of meat, milk, fish, or eggs.

6. Conclusion

Infrared rays are electromagnetic radiation with wavelengths longer than light that the naked eye can see. Normally, our eyes can see 7 colors of light from purple to red, of which red light has the largest wavelength of 700nm. Hence, infrared rays will have wavelengths between 700 nm and 1 mm and are divided into three categories according to wavelength. These include near infrared rays, mid infrared rays and far infrared rays. Far infrared rays have the longest wavelength and have the lowest radiation energy.

In our study, we find out advantages of infrared rays products such as stoves (infrared), infrared sensor and LEDs emitting infrared and water filtration.

Future Research Direction Recommendations

We need to deepen our research in new product development for infrared rays applications.

More industrial uses of infrared rays system are needed to explore and discover and research as so far many infrared rays system have been developed for home applications and hospital equipment.

Limitation of Research

We need to propose risk management solutions to avoid bad or negative effects of infrared rays.

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