NOGUCHI MEDICAL RESEARCH, Co.,Ltd.

June28, 2021

To : BAE International Sdn Bhd

Noguchi Medical Research Co., Ltd.
Department of Product Development
Director Sachie Sekikawa CRD

Far-infrared spectral emissivity measurement report

We would like to report the following about the subject you requested.

Details

Measurement sample : BAE Energy Fabric
Test location : Kaken Test Center, Tokyo Office Analysis Lab
1-7-22 Saiwaicho, Kawaguchi City, Saitama Prefecture
Report number; TB-21-001811
Test method: Far-infrared spectral emissivity / FT-IR method (designated by Far-Infrared Association) mutatis mutandis
Integral measurement wavelength range; 4-20 μm

- Measurement temperature: 40 ° C
- Measurement surface; blue surface

Results

The emissivity of the BAE Energy Sheet was 83.7% compared to the blackbody.

Sample	Integral spectral emissivity (%)
BAE Energy Fabric	83.7%

【Consideration】

In recent years, due to the growing awareness of environmental protection, especially energy conservation, there is an increasing demand for fibers with enhanced functionality such as "warmth" and "heat retention" to enhance the comfort of the human living environment, and the far-infrared emissivity is also the same. It is one of the functional parameters.

This time, a BAE energy Fabric was used as a sample. The emissivity measurement result was 83.7% in the measurement wavelength range of 4-20 μm.

Generally, it is said that the sintered body of a mineral called ceramics has a high far-infrared emissivity (quartz (SiO2) described in the attached document is also a raw material for ceramics), but its emissivity is almost the same. It can be said that the numbers are about the same.

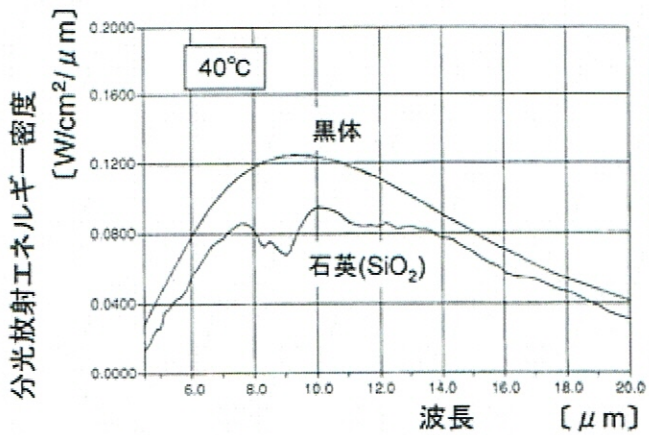
"Cloth" is used not only as a clothing material in the human living environment, but also for a wide variety of uses. Therefore, this sample will be used to manufacture products with added functionality in such applications. It is thought that it has the potential of.

[Reference]

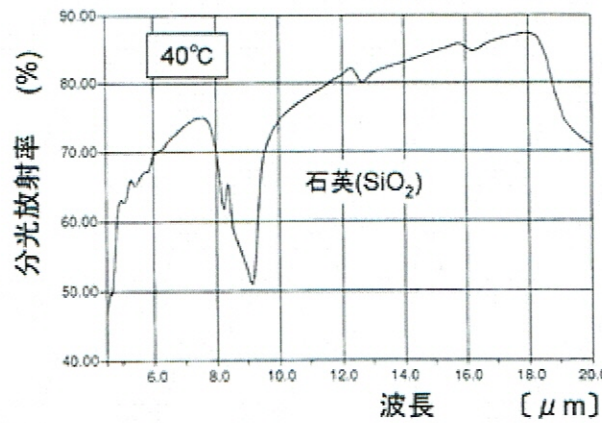
Nagasaki Ceramics Technology Center Research Report
(2013)https://www.pref.nagasaki.jp/yogyo/report_kenkyu/pdf/h25/Report_H25_10.pdf

[Reference]

-About emissivity- The ratio of the amount of energy radiated from the surface of a substance at a certain temperature to the amount of energy radiated from a black body (a virtual object that absorbs 100% of the energy given by radiation) at the same temperature is called emissivity. The emissivity differs depending on the substance and is unique to the substance, but it changes depending on the surface condition (roughness, etc.) and wavelength.
In general, ceramics (including metal oxides) have a high emissivity in the far-infrared region and can effectively radiate energy, so that they are widely used as a radiation material for far-infrared rays. On the other hand, the emissivity of the unoxidized metal surface generally shows a very low value.



The blackbody curve is in the ideal state, and if it is close to the blackbody curve, the emissivity is high.



Spectral radiation is the ratio of the spectral density of the radiant exitance of a thermal radiator at the same rate and a complete radiator (blackbody).

—What is FTIR—
FT-IR is a Fourier Transform Infrared Spectroscopy (FTIR), which is an analyzer that mainly estimates the structure (qualitative) of organic compounds.
When a molecule is irradiated with infrared rays, it absorbs infrared rays corresponding to the vibration energy between the atoms that make up the molecule.
Infrared spectroscopy is used to estimate and quantify the structure of a compound by examining the degree of absorption.
From the early days to the latest, the mainstream of infrared spectroscopy equipment was the distributed infrared spectrophotometer using a diffraction grating. Fourier transform infrared spectrophotometer (FT-IR), which has an interferometer and a computerized computer processing unit, is currently the mainstream.