

CATALYTIC EMITTER - An old idea in new clothes



1. Physical Basis

There are three kinds to transfer heat: conduction, convection and radiation.

In case of conduction the heat is transferred from the molecules with higher temperature to the molecules with lower temperature within a body, without inducing a mass flow rate.

In case of heat transfer via convection the molecules change their position in a room, that means they are flowing and are taking away with them their heat content. During this process they emit their heat to the neighbouring molecules with lower temperature.

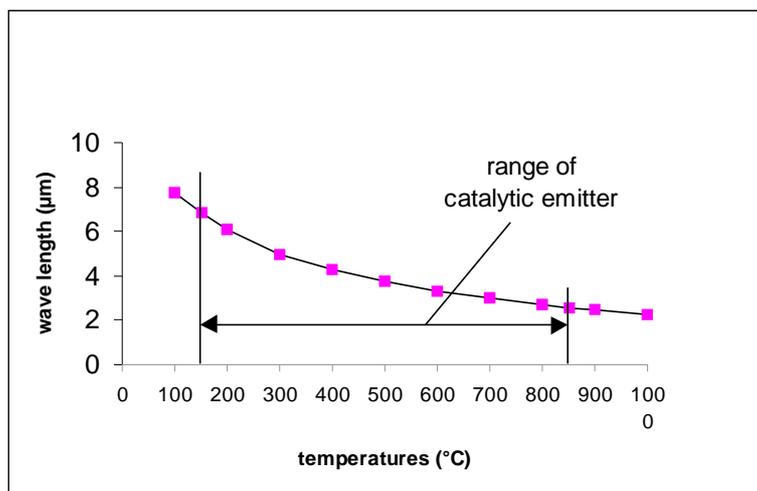
The third kind of heat transfer which is most interesting here, is heat radiation, also called infrared radiation. It is most different to conduction and convection.

In the scientific sense the infrared radiation is explained by inter-atomic resp. inter-molecular processes. It is an electromagnetic wave which is not visible for the human eye. The shortest wave length will be found in radiation in height and space; the longest are the "Hertz" waves. Between them, following the radiation in height, there are the gamma rays, the X-rays, the ultraviolet rays, bordering upon the rays of light. Now are following the infrared rays and the electrical rays, which could reach a length exceeding 1,000 km.

The infrared rays are consequently electromagnetic vibrations or waves, which are emitted by a radiating body and which travel in straight lines. They differ from other rays only by their wave length. When meeting an object they are totally or partly transferred into sensible heat, depending on the characteristics of the object.

For industrial drying and heating processes or for physiological heating wave lengths between 1.5 to 4.5 μm are used. Other wave lengths are of no essential importance for this purpose.

Temperature range catalytic emitter



2. Problem

For heat treatment of many products by means of IR burners it is not necessary to use a high relative energy density at short wave lengths. On the contrary a uniformly distributed IR radiation with lower thermal load at a large wave length distribution often is beneficial for the process. This is the case while curing of certain powder coats or when drying wet paints.

For economic reasons more and more natural gas or propane is used as heating energy.

3. Solution

In such cases GoGaS catalytic emitters are used. They pertain to the group of long wave emitters and are working on the principle of oxidation of gases with the help of suitable catalysts. The combustion gases are oxidized by means of catalysts and without a flame (below the adiabatic flame temperature).

In order to start the chemical reaction the panel must be preheated at least to the lowest reaction temperature. During the start this is effected by means of an electrical wire; during operation a small part of the released reaction's enthalpy is sufficient. The time for heating up is only some minutes.

The GoGaS catalytic emitter reaches a surface temperature during operation of about 550 - 600 °C. The energy density amounts to approx. 20 kW/m².

The panel emits a long wave, infrared radiation in a range between 2 - 8 µm. Many materials can very good absorb an infrared radiation in a range of 2 to 6 µm, which is beneficial to many processes.

Catalytic emitters are explosion-proof regarding mixtures of gas and solvent/air. This is an important characteristic for the paint manufacturing and plastic manufacturing industry.

GoGaS catalytic emitters can be used in new process heating systems or retrofitted to existing equipment. They can be zoned either horizontally or vertically in rows and are electronically controlled to provide different heat intensities to suit varying operational circumstances and product requirements. Manufactured under an ISO 9000ff manufacturing programme, these emitters are highly reliable.

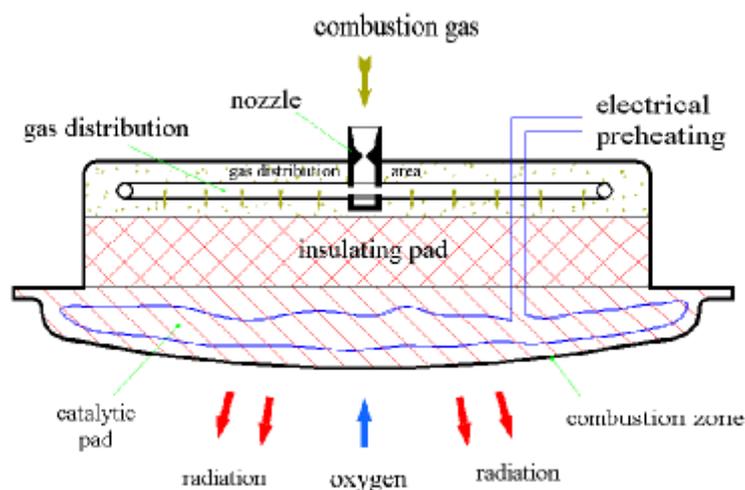


View into dryer with
GoGaS catalytic emitters

4. Description of the GoGaS catalytic emitter (standard equipment)

Fuel enters a sealed housing and is evenly dispersed by means of an internal gas distribution system. The fuel then passes through an insulating pad that restricts the heat from being transferred through the back of the unit. By resisting the flow it also aids in dispersion of the gas. When the fuel enters the catalyst pad, it reacts with oxygen from the atmosphere and oxidation occurs resulting in the release of long wave infrared radiant energy.

Section through a catalytic emitter



The infrared frequency produced by catalytic emitters corresponds almost exactly with the absorption spectrum of organic coatings. This is achieved by use of a catalyst made up of platinum and other rare metals which combust gas without generating any flame. As a result of the exothermal reaction heat is produced. This means that VOC's are destroyed, which come into contact with the panel surface.

During the curing process of coatings the infrared rays penetrate the core of the paint film, leaving the surface open, without skinning, thus allowing solvents and trapped moisture to be rapidly evaporated. Homogenisation of the material takes place shortly afterwards, ensuring excellent adhesion, hardness and maximum gloss.

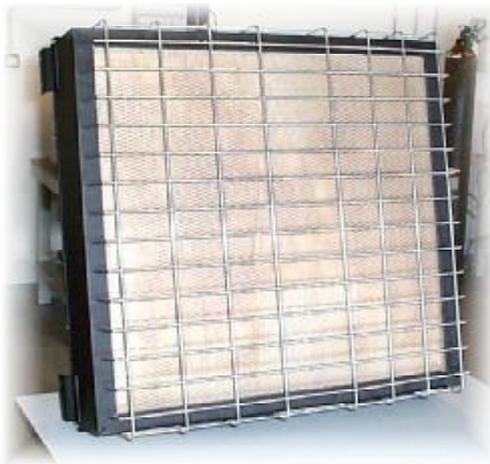
GoGaS offers several types of gas infrared catalytic emitters. They operate either with natural gas or with propane and a preheat element with a voltage of 230 or 400 volt.

Catalytic Emitters with forced convection

Besides the standard type GoGaS also delivers catalytic emitters with forced convection. To reach this the emitter is installed in a housing with fresh air fan at the back. The air is led through slots to the front side of the emitter.

This type of catalytic emitter is used in such places where a sufficient supply with oxygen is not guaranteed (i.e. in closed oven constructions).

Front



Back



Catalytic emitter with forced convection

Types of catalytic emitters (*¹=standard type / *²= with forced convection)

Type	External dimensions W x L in mm	Installed value (kW)	
		min.	max.
TC 12.48* ¹	305 x 1.220	2,5	7,0
TC 18.60* ¹	460 x 1.525	5,0	13,0
TC 18.72* ¹	460 x 1.830	6,0	16,0
BC 24 x 24* ²	620 x 620	4,0	10,0
BC 18 x 48* ²	480 x 1.228	6,0	15,0
BC 18 x 60* ²	480 x 1.535	7,6	19,0

In addition GoGaS can custom design and manufacture catalytic emitters to suit your individual requirements.