



SPACE-RAY® INFRARED GAS HEATERS

Division of Gas-Fired Products, Inc.

Post Office Box 36485 (28236) • 305 Doggett Street (28203) • Charlotte, North Carolina

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WHAT IS CALORIZATION?

Space-Ray, a leading manufacturer of unitized infrared tube heaters, has manufactured infrared heaters with calorized-aluminized steel tubes since 1968. The benefits of calorized tubes are as follows:

+ **Unsurpassed Corrosion Resistance:**

The calorization process provides unsurpassed corrosion resistance to ferrous metal by providing a self-forming, self-healing coating of practically infusible alumina which is impervious to oxygen, carbon, sulphur and the products of combustion of natural and liquified propane gas. The aluminized steel tubing is heat treated up to 1400°F where the aluminum coating (supplied by aluminized steel) is fused into the tubing. The calorization process (heat treating) forms a homogenous layer of iron-aluminum (Fe-Al), which is extremely oxidization resistant. Ideal for corrosive applications such as waste water treatment plants, car washes, dairy barns, swimming pools, and other high humidity applications

+ **Higher Operating Temperatures:**

This protective coating of the homogeneous alloy (Fe-Al) can withstand higher operating temperatures than other conventional tube materials (as certified by Armco Research and Technology Laboratories). The maximum operating emitter tube temperature is 1250°F.

+ **Higher Surface Emissivity:**

An additional benefit of the calorization process is a greatly enhanced external surface emissivity as well as improved internal surface absorptivity. During the calorization process, the surface morphology changes into a very rough and irregular surface, on a microscopic scale. The measured emissivities vary from 0.80 to 0.86 depending on the emitter tube surface temperature. The dark homogenous Fe-Al layer also produces a very absorptive interior tube surface which is highly desirable from a heat transfer efficiency standpoint.

+ **Life Expectancy:**

The life expectancy of calorized-aluminized steel tubes is 27 years. A review of Space-Ray customers (e.g., Canadian Pacific Railroad, Coatings, Inc., etc.) shows that some users report an average emitter life of over 27 years, even in an 11,000 degree day operating environment.



ARMCO RESEARCH & TECHNOLOGY

April 24, 1986

Mr. William P. Horne
Chief Engineer
305 Doggett Street
P. O. Box 36485
Charlotte, NC 28236

Dear Mr. Horne:

It has come to my attention that some heater tube manufacturers utilize bare or uncoated steel for the elevated temperature application. I want to relay to a couple of facts concerning ALUMINIZED Steel.

Uncoated carbon steel has poor oxidation resistance that is greatly accelerated above 700°F. The aluminum that is supplied on ALUMINIZED Type 1 and then is diffused into the steel (calorized) forms an Fe-Al alloy layer that is extremely oxidation resistant. This layer remains intact up to 1250°F on ALUMINIZED! Type 1. The maximum useful service temperature is therefore 1250°F.

The diffusion of the aluminum into the steel has yet another benefit. The surface morphology that forms upon diffusion (calorizing) is very rough and irregular on a microscopic scale. The benefit is that the microscopic rough surface changes the emissivity from about .2 (before calorizing) to about .8 (after calorizing). This is, of course, desirable from a heating efficiency standpoint.

I hope this information will be of help to you and if you have any more questions, don't hesitate to contact me.

Sincerely,

A handwritten signature in cursive script that reads 'Steven L. Boston'.

S. L. Boston
Research Engineer
Coatings Research
Research & Technology

SLB/ca

cc: A. F. Gibson