



## Higher Potency Extracts Produced With Flameless Catalytic Infrared Energy

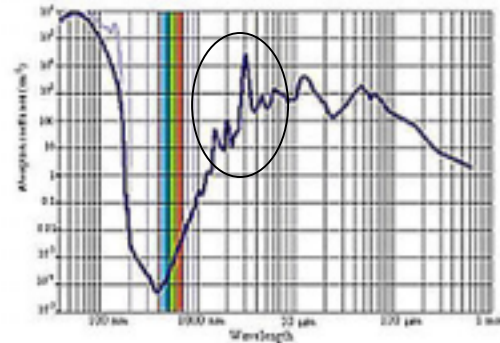
### **Flameless Catalytic Infrared Heating Removes Moisture Efficiently, at Low Temperature. Low Heat Drying Improves the Potency of Antioxidants and Nutraceutical Extracts**

Catalytic Drying Technologies LLC (CDT), the leading supplier of catalytic heating equipment, brings 50 years of proprietary catalytic infrared technology to food processing through a patented process which combines flameless catalytic infrared energy with a unique conveying system. This system is designed to efficiently and effectively dehydrate small grains, herbs, vegetables and smaller fruits and fruit pieces. Recent trials at our corporate test facility have shown remarkable improvement in the potency of Vitamin E extract from rosemary, and in the quality of tarragon extracts. CDT seeks applications whereby this technology can improve process efficiencies and yields when applied to products being prepared for extraction.

#### **What is Flameless Catalytic Infrared?**

Flameless Catalytic Infrared Energy (FCIR) is generated by catalyzing natural gas or propane with a proprietary enhanced platinum catalyst. Natural gas, when combined with air across the platinum catalyst, reacts by oxidation-reduction to yield a controlled bandwidth of infrared energy and small

amounts of CO<sub>2</sub> and water vapor. The key to this process is that the bulk of the radiant energy bandwidth generated is in the “far infrared” range, with wavelengths ranging from approximately 3 to 7 microns.



Water absorption spectrum – note absorption peaks at 3, 4.5 and 6 microns

Water absorbs energy extremely efficiently at 3, 4.5 and 6 microns. By directing this energy spectrum at water-containing products, evaporative energy is targeted to the water within the product. Far infrared does not heat the air, therefore energy is transferred very efficiently. Products can be dried from very high moistures to intermediate, and even very low moistures, without exposing the product to high temperatures or the damaging effects of high rate convection drying. Tests on herbs containing as much as 88% moisture have yielded excellent quality, even when these products are dried to moisture levels below 10%.

Of significant importance is the fact that CDT's far infrared energy is supplied through the catalyzing of natural gas or propane, without flame. Energy conversion is quite high compared to conventional drying systems. We've demonstrated dehydration energy efficiencies at 1,200 BTU's per pound of water removed in some cases, while most conventional convection dryers use over 2,000 BTU's per pound of water removed, not to mention the power they require to move large quantities of air. And this at product temperatures that never exceed 110 deg. F.!

Important in the overall design is the method whereby the product is presented to the far infrared radiant energy source. CDT holds a patent on a dryer configuration that includes a unique conveyor, which gently tumbles the product while transferring it along and below the FCIR energy source. CDT's in-house engineering staff stands ready to custom-configure a dryer to fit any product application.

At CDT headquarters, Independence, KS, we are able to provide product testing and scale-up research using small scale laboratory systems as well as a large pilot dryer.



CDT's pilot scale test dryer – 4 ft. x 30 ft. unit

Research Support – Our initial efforts applied this technology to wood chip drying through a grant from the US Department of Energy. Over the past

two years we've moved into agricultural crops. We've placed test units at the University of Arkansas and the University of California, Davis, where numerous programs are underway that will lead to published research on many aspects of the application of FCIR in food dehydration. Current university work focuses on rice processing, barley processing, and food quality. As we expand our technology to incorporate exciting new applications for nutraceutical products, our fundamental research support will expand as well.

Products tested – We've tested a wide range of products with excellent results. In one series of tests, we dried freshly-harvested rosemary. Apart from the efficient drying this process provides, the vitamin E extracted from this product after drying was tested against control samples extracted from conventionally dried product. Our extracts were over twice as potent when used to prevent oxidation of the test substrate.

CDT is eager to help you evaluate flameless catalytic infrared energy as a way to significantly improve your current processes and improve product performance. We can design test protocols and, through bench and pilot scale testing, custom design an application that's right for your business.

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