



## HIGH TEMPERATURE REACTION CHAMBER FOR THE PRAYING MANTIS

Diffuse reflection spectroscopy is a very sensitive method for detecting changes at the surfaces of rough materials. It is particularly effective for powders that have high surface areas. This makes diffuse reflectance a valuable tool for studying heterogeneous catalysis, gas-solid interactions, photochemical reactions, and oxidation mechanisms. This High Temperature Reaction Chamber is well suited for performing such studies under carefully controlled temperatures and pressures.

### APPLICATIONS

- ▶ Allows diffuse reflection measurements under controlled temperatures and pressures.
- ▶ Used in conjunction with the Praying Mantis Diffuse Reflection Accessory.

### FEATURES

- ▶ Designed for operation from high vacuum (133  $\mu$ Pa or  $10^{-6}$  torr) to 133 kPa (1 ktorr) with KBr windows or 1.5 MPa (11.2 ktorr) with ZnSe or SiO<sub>2</sub> windows.
- ▶ Achieves temperatures up to 910°C (under vacuum).
- ▶ Three inlet/outlet ports provided for evacuating the cell and introducing gases.
- ▶ Made of chemically resistant 316 stainless steel.
- ▶ Readily adapted for operation up to 3.44MPa (25.8 ktorr) with an optional high-pressure dome.
- ▶ Alternative window assemblies available for microspectroscopy applications, including Raman.
- ▶ Optional Silcotek coatings available for superior inertness and corrosion resistance.
- ▶ Cooling cartridge available for moderate cooling or heating with a circulator.



### INCLUDES

- ▶ Reaction Chamber.
- ▶ Low-voltage heating cartridge.
- ▶ K-type thermocouple.
- ▶ Sample packing tool and spill tray.
- ▶ Standard dome with one glass observation window and two windows for the infrared, ZnSe or KBr, or two SiO<sub>2</sub> windows for the UV-Vis-NIR.

WINDOWS FOR THE REACTION CHAMBER DOMES		
Material	Standard Dome (2mm thick)	High Pressure Dome (4mm thick)
SiO <sub>2</sub>	WAD-U23	WAD-U43
Si	WED-U23	--
CaF <sub>2</sub>	WFD-U23	--
ZnS	WID-U23	WID-U43
ZnSe	WMD-U23	WMD-U43
KBr	WPD-U23	--

### ORDERING INFORMATION

CATALOG NO

High Temperature Reaction Chamber, 24V (FTIR, KBr windows).....HVC-DRP-5  
 High Temperature Reaction Chamber, 24V (FTIR, ZnSe windows).....HVC-DRM-5  
 High Temperature Reaction Chamber, 24V (UV-Vis-NIR, SiO<sub>2</sub>).....HVC-VUV-5

### OPTIONS & REPLACEMENT PARTS

Screen Set, two each of three mesh sizes.....116-439	High Pressure Dome, ZnS Windows.....HVC-DWI-3
Four Ceramic Filters, 80 $\mu$ m maximum pore dia.....HVC-CER	High Pressure Dome, ZnSe Windows.....HVC-DWM-3
K-Type Thermocouple.....008-144	High Pressure Dome, SiO <sub>2</sub> Windows.....HVC-DWA-3
FKM O-Ring Set.....HVC-ORV	Heater Assembly.....HVC-HT4
FFKM O-Ring Set.....HVC-ORK	Heater, 24V.....HTRS-26
Window Assembly for Microscopy.....HVC-MRA	Purge Shield.....DRP-PDR
Cooling Cartridge.....HVC-COL	
110V	220/240V
Temperature Controller with adapter, 24V output.....ATK-024-3	ATK-024-4 (CE marked)

Harrick Scientific offers a High Temperature Reaction Chamber for use with the Praying Mantis Diffuse Reflection Accessory for studying powders and other rough surfaced materials in a controlled environment at elevated temperatures and various pressures.

This reaction chamber is constructed of chemically resistant 316 stainless steel and features a sample cup that is part of a temperature-controlled sample stage. This stage incorporates a cartridge heater and K-type thermocouple. The stage is thermally isolated from the outer chamber. A water-cooling jacket is provided to control the temperature of the outer chamber and windows during high temperature operation. The reaction chamber also features three gas ports for evacuating, pressurizing, or flowing gas through the sample. These ports have 1/4" VCO fittings with FKM o-rings. One of these ports leads directly under the sample cup; the other two lead into the sides of the chamber.

Optically, this reaction chamber is designed to minimize reflection losses from the windows and maximize light interaction with the sample. The radiation enters and exits the chamber perpendicular to the two optical apertures. A third aperture is provided for viewing, illuminating, or irradiating the sample. This makes the reaction chamber useful for photochemical studies. The High Temperature Reaction Chamber includes two infrared windows, KBr or ZnSe, and a glass observation window for the FTIR, or two SiO<sub>2</sub> windows and a glass observation window for the UV-Vis-NIR. These windows are mounted in a removable stainless steel dome using o-ring seals. This reaction chamber can be operated from high vacuum to two or three atmospheres with the KBr or SiO<sub>2</sub> and glass windows provided. Other window materials are available for different wavelength regions. Low refractive index window materials should be selected to minimize reflection losses.

The High Temperature Reaction Chamber is designed for operation from room temperature up to 910°C under vacuum. It can be adapted for use at higher pressures by simply replacing the dome assembly. The optional high-pressure dome assembly utilizes two optical windows and a UV quartz observation window mounted in a stainless steel dome; windows for the high-pressure dome are 4mm thick. ZnS, ZnSe and UV quartz are offered for operation to 3.44 MPa (25.8 ktorr). At higher pressures, the maximum attainable temperature might be lower, due to heat losses that depend upon thermal characteristics of the sample, reactant gas, and gas pressure.. For optimal temperature control, Harrick Scientific recommends our Temperature Controller for stable heating of the system. Heater and thermocouple connectors are compatible with this controller..

Figure 1 shows several spectra recorded with the High Temperature Reaction Chamber in the Praying Mantis Diffuse Reflection Attachment. Harrick's Temperature Controller was used to regulate the temperature.

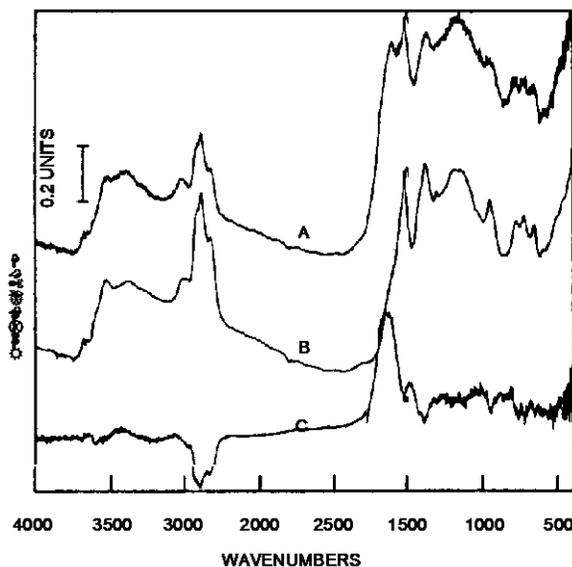


Figure 1. Diffuse Reflection of Wyodak Coal a) after 24 hrs. of oxidation at 2.4KPa at 393°C, b) dried unoxidized samples, and c) the difference spectrum (a-b).