Introducing the Vapourtec UV-150 Photochemical Reactor

Continuous Photochemical Reactions

Photochemistry, the use of light to effect chemical reactions, has a number of important applications both in nature, such as photosynthesis and vitamin D formation, and in industry. However for the modern synthetic chemist photochemistry at lab scale has fallen out of favour. There are a number of reasons for this including; availability and complexity of equipment, safety, control of reaction conditions and difficulty in scale up.

Vapourtec has now made available for both the E-Series and R-Series systems an advanced photo chemical reactor intended for continuous flow operation. By eliminating the problems associated with traditional batch photochemistry Vapourtec's new reactor, the UV-150 enables chemists to take full advantage of the powerful reactions and synthetic routes offered by photo chemical reactions.

Features of the UV-150

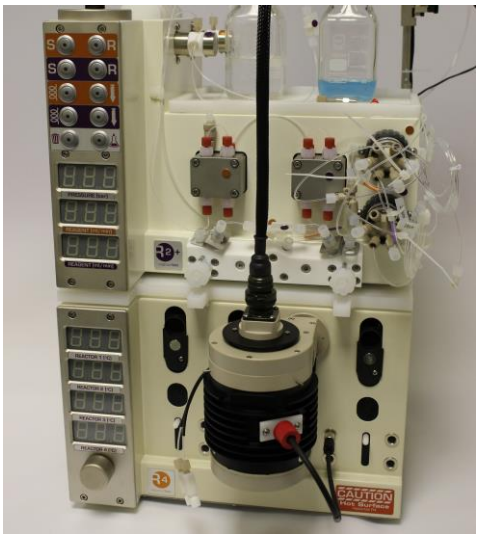
- Fits both E and R-Series systems
- Multiple gram / hour scale-up
- High intensity UV light source
- User selectable UV power
- Light source wavelength filtering
- Temperature control -5^{0}C to 80^{0}C
- Easily changed reactors
- Space saving compact design
- Interlocks ensure safe operation
- Optional spectrometer for real time monitoring of transmission spectra

Use with E-Series & R-Series

The UV-150 has been design to interface with both Vapourtec R-Series and E-Series flow chemistry systems.

In common with the Vapourtec family of reactors the UV-150 simply plugs into the ports in the system. Connecting the temperature sensor and power supply module to the E-Series or R-Series system completes the installation.

Installing and getting a reaction running with the UV-150 reactor takes less than 5 minutes.

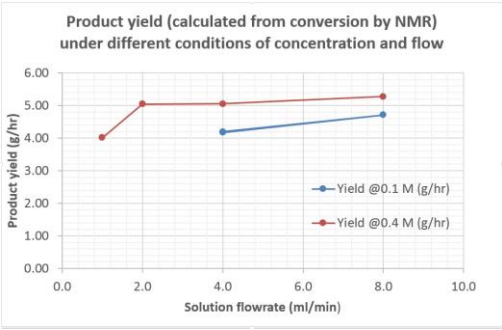


Multiple gram/hour scale up

Don't be fooled by the UV-150's compact size. The high power of the medium pressure mercury lamp allows the UV-150 to synthesise multiple gram / hour quantities of material.

In an experiment to replicate the [2+2] Cycloaddition of Maleimide and 1-Hexyne from published literature, conversions of greater than 5g / hour have been achieved.

[2+2] Cycloaddition of Maleimide and 1-Hexyne



Intense UV Light Source

At the heart of the UV-150 is a compact, high intensity medium pressure metal halide lamp.

The shrouded lamp is manufactured specifically for Vapourtec and has been designed to allow for dimmable operation under air cooled conditions without compromise to either lamp life or spectral output.

Standard lamps have a pure mercury spectra. However, special “doped” versions are available on request.

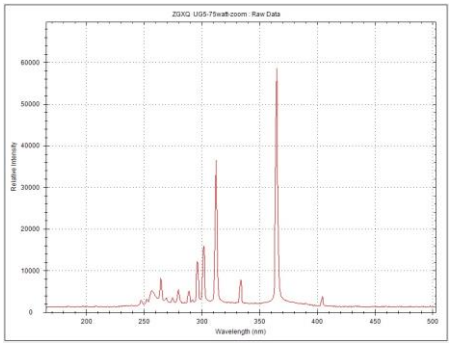
Selectable UV power

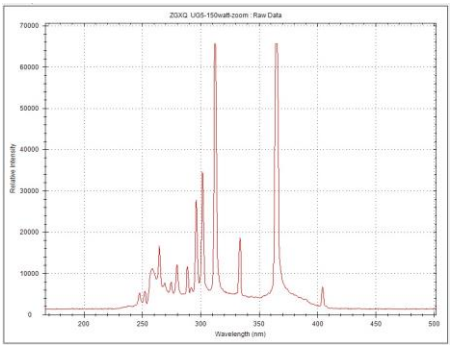
The UV-150 features a state of the art electronic ballast supplying power to first strike the arc then maintain a precise and constant power output.

The electronic ballast is designed to maximise the lamp life. In addition power control is provided giving operation from 75 watts to 150 watts.

Lamp power and current are continuously monitored. These parameters can be logged when using the Vapourtec control software FlowCommander™.

Lamp end of life and other fault conditions are automatically detected. Under fault conditions the system is shut down in a safe manner.



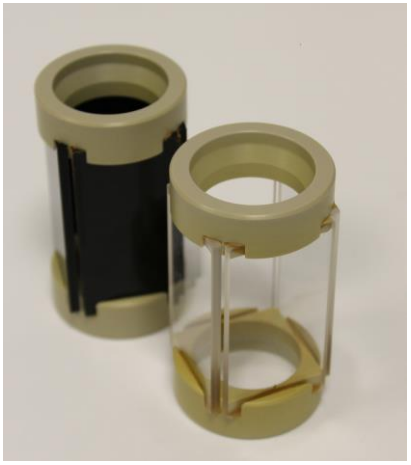


Wavelength Filtering

An important feature of the UV-150 is an optical filter positioned between the light source and the reactor.

A range of band-pass and long-pass filters is available to ensure that your reactants are only exposed to light of the desired range of wavelengths.

Filters can be quickly and easily changed to explore reaction conditions and develop a thorough understanding of the critical reaction parameters.



Temperature Control

To ensure the best possible reaction selectivity the UV-150 is provided with a temperature controlled environment for the duration of the reactant's passage through the reactor. Within the UV-150, the reactor region is separated and sealed from the lamp region.

The reactor temperature can be set between -5^{O}C and 80^{O}C with resolution of 1^{O}C.

Cooling is simply provided by the Vapourtec cooling module. Existing customers having a cooled reactor can use their standard dry-ice cooling module with the UV-150.

Easily changed reactors

The UV-150 uses reactors constructed from a single layer of small bore, thin walled Fluorinated ethylene propylene (FEP) tubing.

Reactors are constructed into cartridges. The cartridges (see photo) can be removed and replaced in seconds.

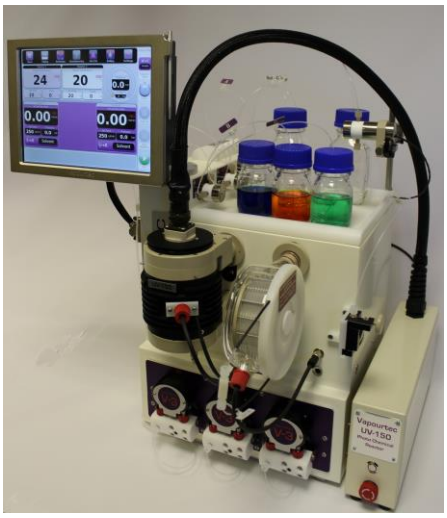
To maximise absorption of photons by the reagents, materials exposed to UV are restricted to quartz and FEP.

Standard reactor cartridges are 2ml, 5ml or 10ml volume. Smaller reactors are advantageous in minimising reagent consumption when exploring reaction conditions.

Compact design

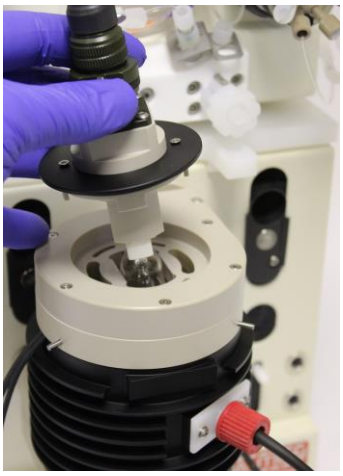
The UV-150 is a fraction of the size of a typical immersion well type photochemical reactor. In addition the UV-150 does not require a large and complex recirculating chiller that is traditionally used for cooling the lamp.

The compact size means that the UV-150 only uses one reactor position (E-Series) or two reactor positions (R-Series) leaving scope for multiple step (telescoped) reactions that include a photo chemical step.



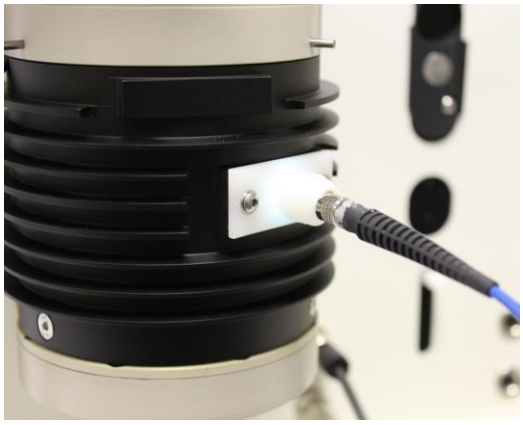
Interlocked for safe operation

The light source housed within the UV-150 is totally enclosed, allowing safe operation of the UV-150 in a standard laboratory fume cabinet.



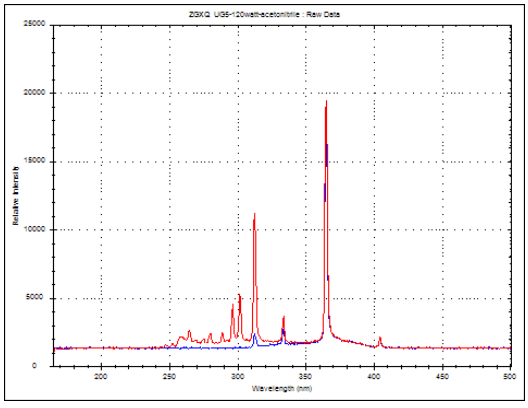
The power supply to the UV-150 is interlocked to ensure power is safely removed from the system even under the conditions where the User attempts to dismantle the housing with the lamp under power.

Real Time Spectral data



When undertaking photo chemical reactions it is highly advantageous to measure the wavelengths and spectral intensity that the reagents are exposed to. It is also valuable to measure the degree of absorption by the reactants at different wavelengths.

The UV-150 is provided with the fixture to clamp a fibre-optic probe for conveying light to a spectrometer for analysis. The port is located so that the probe can “look through” the reactor towards the lamp. In this way a spectrometer can be used to measure the relative spectral intensity of exposure of the reactants, even in real time while the reaction is running. Vapourtec can supply a suitable fibre-optic probe and CCD Spectrometer if required.



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