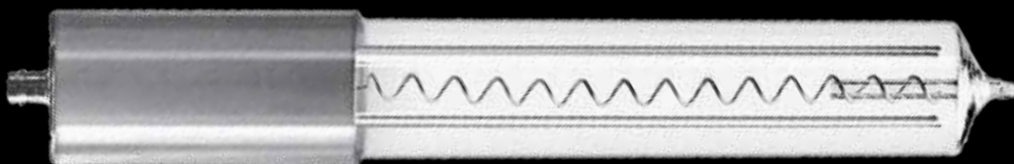


**Radium
TECH**



Made in
Germany

Radium TECH.
**Your competent and
reliable partner for
UV- and IR-solutions.**

www.tech.radium.de

UV-Excimer Technology.

XERADEX® 172 nm Excimer Lamps.



Application fields

- Breaking chemical bonds on surfaces, surface activation
- Improvement of adhesiveness
- Elimination of organic residue/dirt
- Water purification
- Improvement of pumping power of vacuum pumps
- Matting of acrylic lacquers without matting agents
- Lacquer hardening
- Semiconductor industry
- Measurement technology

Product properties

- No heating up phase: Instant radiation!
- For huge surfaces and high speeds
- Monochromatic radiation of 172 nm, no UV-A or UV-B
- Very efficient, conversion efficiency of about 40 %
- Cooling often not required (nitrogen purging)
- No limitation on switching cycles
- Light weight
- Long service life (up to 2500 h)
- Made in Germany

IR-Technology.

Radium Infrared Lamps.



Application fields

- Processing of plastics and thermoforming
- Paper and printing industry
- Paint drying
- Coil coating
- Semi-conductor industry
- Outdoor and indoor zone-heating
- Catering (heated counter tops)
- Infrared cabins

Product properties

- Fast heating effect with highest efficiency
- High operating safety and reliability
- Optimal adjustment and controllability
- Long average lifetime of the lamp
- Instantly full output
- Space-saving, maintenance-friendly installation
- Low operating costs
- Partly coating for directional heat

Excimer UV radiation.

Your powerful tool for surface treatment.

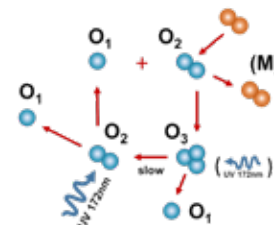
VUV-radiation at a Glance

Radiation with sufficient energy has the ability to crack chemical bonds. Thus, it is able to clean surfaces from organic contaminations by destroying their internal structure. Vacuum UV (VUV), i.e. UV radiation below 200 nm increases the surface energy and the wettability, thus helping to get better adhesion, for example. VUV also cracks O_2 in air and can be used to produce ozone and activated oxygen very effectively and locally for different purposes. Surfaces like those of silicon wafers or other materials can be oxidized in very good quality. By the simultaneous treatment with UV radiation high-quality oxide layers can be produced within shortest time at low temperatures. The ability to destroy organic bonds can also be used to etch plastic surfaces, even PTFE, or to start chemical reactions. This includes the curing of UV coatings in the printing industry. In special cases, there is even the possibility to manage hardening without starter molecules. Beyond that here is a vast variety of applications for Radium XERADEX® lamps.

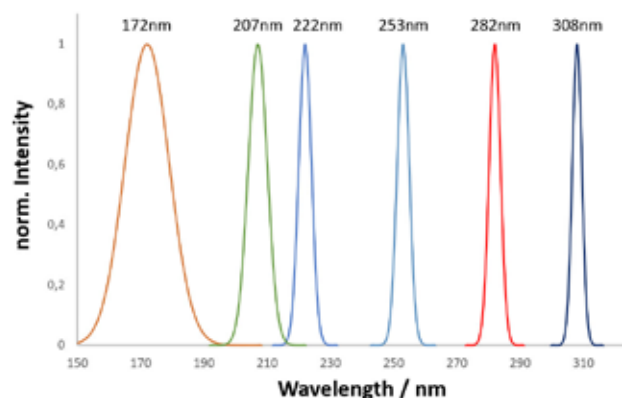
Oxidation, complex Oxidation Processes

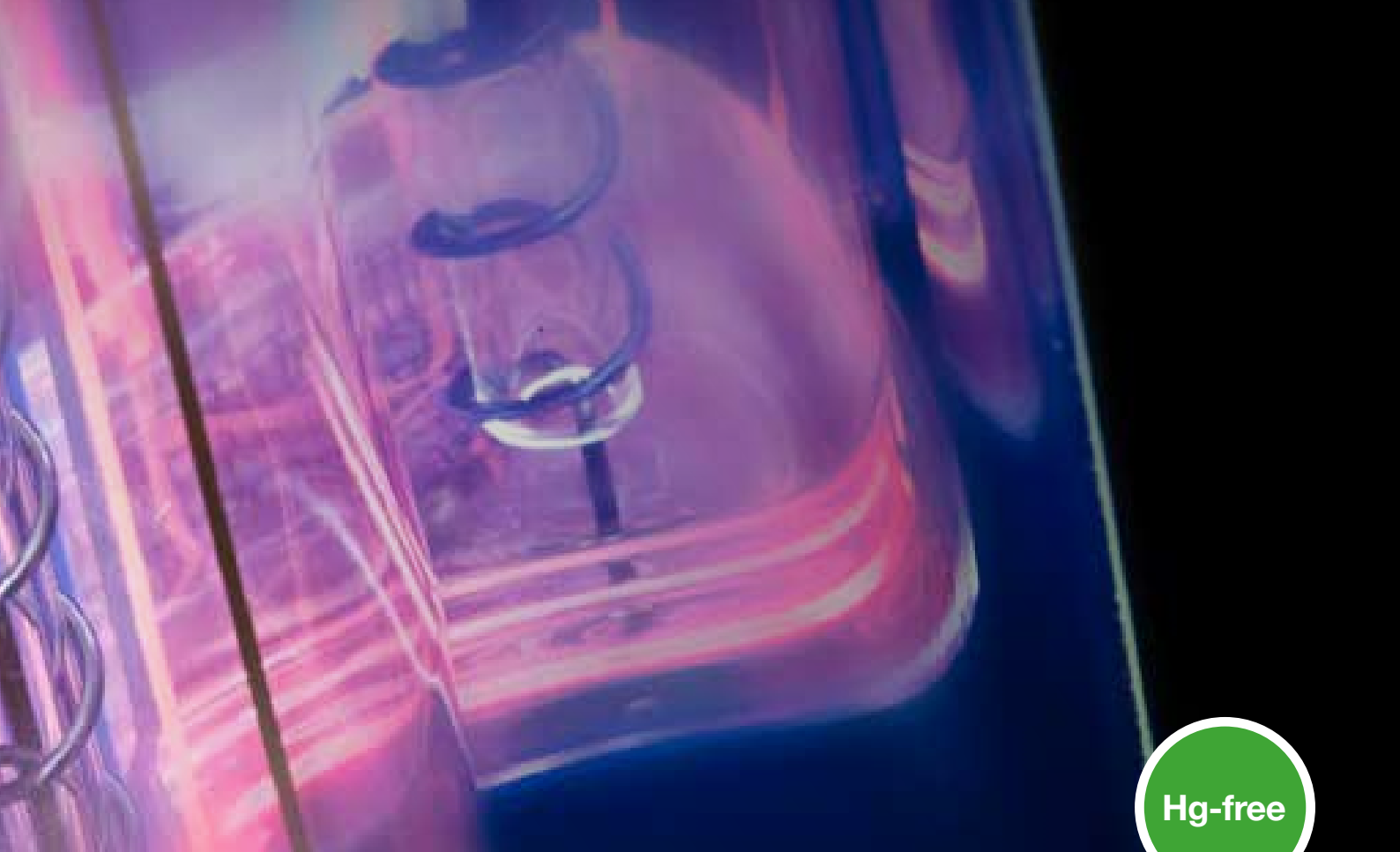
By irradiation with VUV ,old' chemical bonds break up, new ones can be made. In this process, e.g. in air or pure oxygen very efficiently ozone and free oxygen radicals are generated, which in turn can oxidize other substances. The resulting ,waste products' CO_2 and H_2O (water) are non-toxic and easily volatile. Since the 7.2 eV energy of the photons is not sufficient for splitting nitrogen molecules N_2 , toxic nitrogen oxides NO_x cannot develop, in contrast to many plasma processes. Nitrogen can therefore be used as purge gas. The combination of ozone and UV radiation has a particularly oxidizing effect, since not only the binding energy of the ozone but also the radiant energy is available at the same time. This may be interesting for semiconductor processing or oxidation. For example, high-density oxide layers can be produced at low temperatures.

Ozone generation



Spectra - adaptable for your application





Hg-free

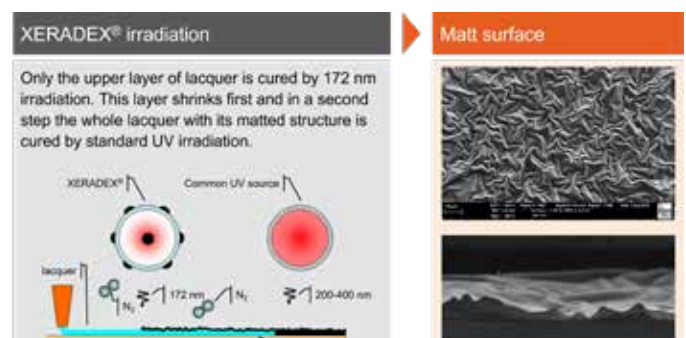
Surface Cleaning, Activation and Sterilization

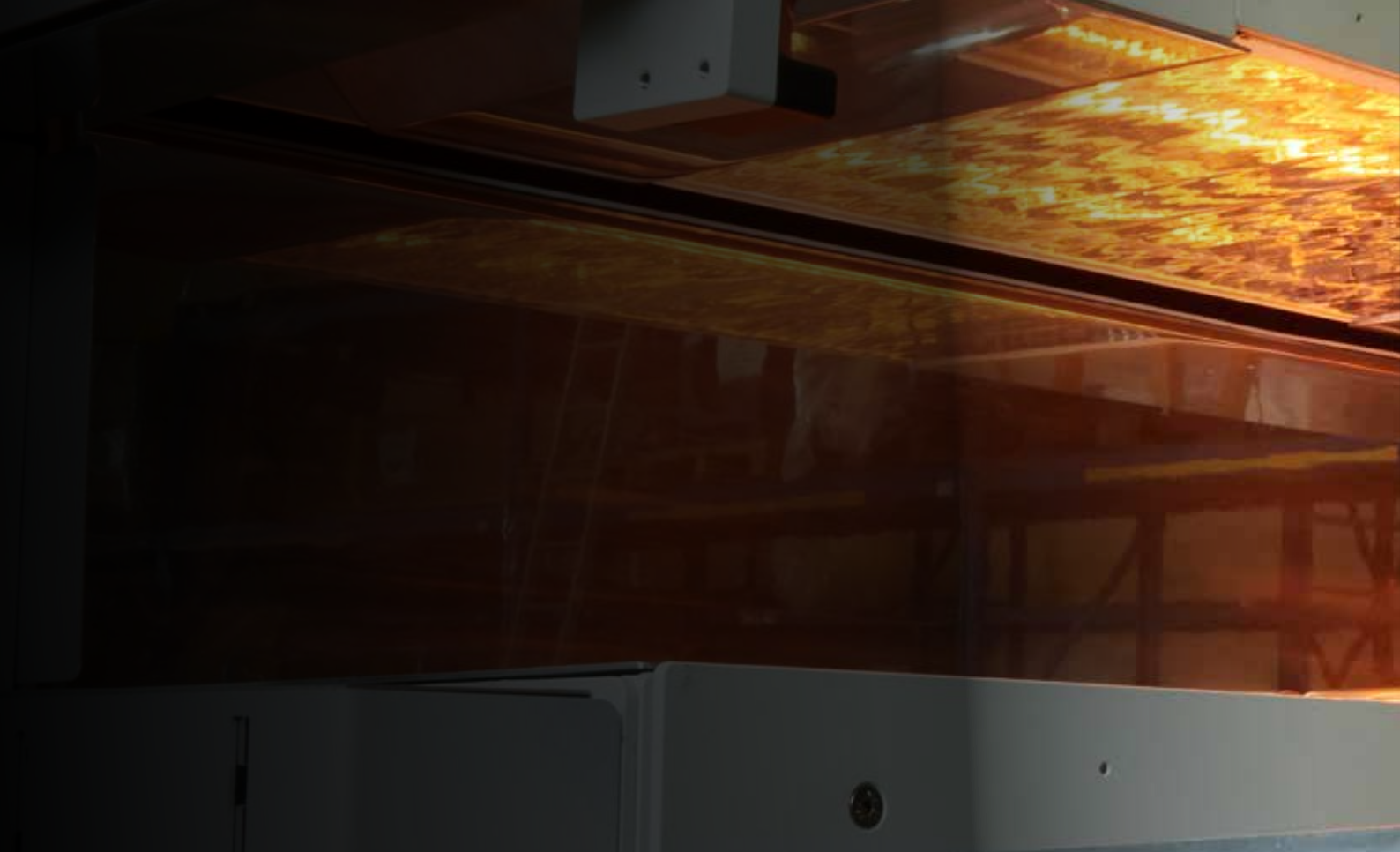
Transport, storage and last but not least production processes leave traces on the adjacent surfaces. These may be water adherences, as well as organic substances such as e.g. greases, oils or release agents. Contaminated surfaces often need to be stripped off this layer for further processing. This stripping can be the mold release agent in the plastic production as well as the water skin in semiconductor manufacturing. This is possible with VUV radiation over a large area. Other surfaces that shall be glued or printed, for example, must be prepared accordingly so that - to stick to the example - adhesive, plastic coating or paint adhere, spread well. This increase in surface energy is also possible across a large area with VUV radiation.

- operation at standard pressure and at room temperature
- without solvents, primer or cleaning agents (no chemicals, no toxic waste)
- when applied in air no NO_x formation
- wide application possibilities: suitable for LCD screens as well as for solar cells or various plastics
- soft on surfaces (no material loss)
- simple process, no secondary processes needed (e.g. post processing)
- saves time and energy

Hardening and Matting of Lacquers (Polymerization)

The matting of UV-curing acrylate coatings using matting agents involves various difficulties. Thus, larger additions of matting agents increase the viscosity excessively and makes very low gloss levels impossible to be achieved. 172 nm excimer radiation offers an alternative here. The 172 nm - radiation does only penetrate the outermost layer of a freshly applied lacquer coating and shrinks that by polymerisation. Afterwards, the whole coating is hardened through/cured by longer waved UV radiation (200 - 400 nm). This results in a 'drapery'-surface-visible in the microscopic view, which achieves very low gloss levels and does also have outstanding haptic properties. The resulting surface is characterized by excellent resistance to mechanical and chemical stress.





Ralotherm Short-Wave Infrared Emitter

TOP in class concerning efficiency

The thermal process using short-wave infrared technology (near infrared) is very efficient and can be adjusted to different materials. Materials have a typical absorption maximum. Many of the substances show this maximum within a wavelength range near to the visible light, starting at about 800 nm. By working in this wavelength range, it is possible to heat up materials in a matter of seconds. Moreover, it can be influenced by a slight shift in the wavelength, whether only the surface or the bulb should be heated. When working with several components, heat can only be selectively transferred to one of the substances. This advantage is used especially in coating processes.

Other technologies are not able to act in a material-specific way, and they also require more time to bring the materials up to temperature.

In addition to this, short wave radiation does not interact with most of the atmospheres which are used in typical processes. This makes the process even more effective.

Radium Ralotherm lamps are available in a big variety of lamp base and mounting systems.



Raloquick Medium-Wave Infrared Emitter

Fast and powerful

The Raloquick emitters are ideal for all processes that require medium-wave radiation and demand high power densities at the same time.



The special filament structure of the emitter type Raloquick combines this unique power density with a short response time. The emitters are also very compact and can be supplied with a tube diameter as small as 11 mm, ensuring ideal space utilization in your facilities.

Furthermore, you have the choice of a big variety of bases and mounting systems depending on your needs. On request, we can supply the emitters coated with a reflector so that the heat can be transferred to your product in an even more targeted manner.

The technical properties of your special emitter will be calculated by our R&D-people according to your needs and designed specifically for your process. Our experienced employees at the Wipperfurth site will then manufacture them according to your specifications, taking into account the highest quality standards - made in Germany.

IR-Technology.

Harness heat specifically.

CO₂
neutral

Raloduo Robust Infrared Emitter

The Tough Twin Tube

Are you looking for a robust concept for emitters with maximum power? We have got the solution for you!

The twin-tube concept is particularly suitable for systems that require a strong bulb which can endure mechanical stress. Raloduo emitters can be used in two tube diameters and in lengths up to 1500 mm. In addition, it is possible to contact these emitters either on both sides or one side - enabled by the twin tube concept, which is particularly advantageous for systems that are difficult to access. Thanks to the laying of the filament in the two sides, there are a multitude of segmentation possibilities to reproduce any radiation profile. Raloduo emitters achieve a line power of up to 250 W/cm. In addition to the high power densities, these emitters are offered in a wide wavelength spectrum including Ralotherm and Raloquick technology. On request, Raloduo emitters can also be coated with a reflector.



Application Center

On request, we also offer the option of using our application center for our customers for practical tests in cooperation with our experts. Either, be it for optimizing existing IR processes or for making new applications highly or even most efficient. Our appliance has got a linear axis with adjustable speeds in order to simulate a practical industrial use. Thus, valuable insights can be gained there already as far as process parameters for the industrial application are concerned. The goal is to give our customers the security of having chosen the right product. Our infrared test bench offers the possibility to carry out experiments with practically any and every substance.

Whichever – it does not matter whether you want to coat, weld or dry. We would like to help you designing your individual process.





Tradition and Innovation. **Made in Germany.**

Radium Lampenwerk GmbH has been founded in 1904 in Wipperfürth - and is nowadays the oldest still active lamps-manufacturer in Germany. We are proud to serve customers and partners in more than 50 countries. In addition to general lighting, Radium has developed and produced infrared and UV lamps from an early stage.

The demand for these technical products in the non-visible spectral range has increased over the years. Today, infrared and UV radiation have become indispensable for many industrial processes, be it thermoforming in the plastics industry, surface treatment or claning purposes in the semicondutor industry. Radium has taken this development into account by founding the business unit „TECH“ in order to be able to react even better to the special requirements of that customer group.

Behind the name Radium-TECH are experienced specialists from the fields of lighting technolgy and material science who know the demands of our industrial customers and can advise them accordingly. Radium-TECH customers have the choice from standardized catalogue products - which are built on high speed production lines - up to customizer-specific individual solutions. Our aim is to help optimizing your production process - and this in a quick and flexible way. The fact that R&D, Sales and production are located under the same roof helps us to be faster, as we can count on short lines of communication.

If we have aroused your curiosity, take a look at our website: www.tech.radium.de.
We will also be happy to advise you personally.

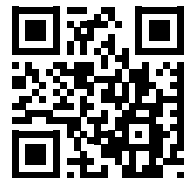
Contacts

Kathrin Stegen

k.stegen@radium.de
Tel.: +49 (0) 2267 81-398

Sascha Hiller

s.hiller@radium.de
Tel.: +49 (0) 2267 81-472



online version

Radium Lampenwerk GmbH

TECH

Dr.-Eugen-Kersting-Str. 6
51688 Wipperfürth
Germany

Telefon +49 (0) 2267 811
Telefax +49 (0) 2267 81353

radium@radium.de
www.radium.de