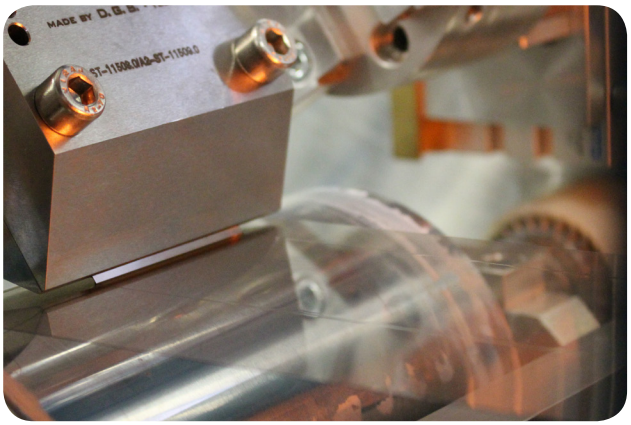
PRESS RELEASE

Ushio's excimer technology enables coatings of thin ITO layers

Oude Meer, March 2018 - In the last decade, excimer radiation sources have gained more and more impact in many fields of surface cleaning, surface activation and hydrophilisation like semiconductor and flat panel display production but also in exotic applications like the photofunctionalisation of human implants for an enhanced healing pace. All these applications are based on the effect of high-energy radiation in combination with oxygen radicals which are made out of the air by the radiation.

Before coating



After coating

Process based on high-energy photons

The treatment works in a two-step process in which biological contaminants are removed residue-free from all kinds of surfaces. In a first step, the chemical bindings of the organic molecules are directly cracked by 172 nm radiation. In the second step, the residues from the split molecules are removed from the surface by radical oxygen and ozone which is generated by the 172 nm radiation out of the thin air layer between the module and the surface.
The advantages of this technique are that there are no dusts created and that the process does not damage the surface or heat it up.
In general, the technique works on all kind of substrates, while originally mainly glass, silicon and other metals were cleaned.
For polymers the cleaning works as well in a way that process contaminations as well as the first adsorption and reaction layers on the polymer with lower surface energies are removed. In addition, it was demonstrated in XPS analysis, that the oxygen content of the surface layers are partly significantly increased (e.g. 5% to 35% with PVC) which also improves the quality for bonding processes afterwards.

No damages to the thin layers

Ushio's excimer radiation is already known for surface activation and cleaning.
What is new:
Excimer radiation can also be used very efficiently on existing coatings like functional coatings or lacquers.
One recent and widely applicable example is the treatment on ITO before the coating with water based light-sensitive polymer layer in the PhotoFlex project to produce organic solar cells (http://www.lat.rub.de/inhalt/forschung/photonflex.html). During this test the surface energy from the ITO

on PET could be enhanced from only 25mN/m to up to 70mN/m in a roll to roll application. Only with excimer technology it is therefore possible to coat the thin Ito layer (100nm thickness range) as any other treatment method would destroy the sensitive film.

No gaps

In the comparison you can directly see, that there is an ideal wetting with the treated foil (right), while the coating liquid sticks to the nozzle for the untreated foil.
The measurements also show, that the film on the treated ITO is homogeneous and without any gaps. With this technique, it is possible to create too, innovative material combinations. With applying masks, it is even possible to treat only specific pattern on the substrates so that the material is only treated where needed or even functional patterns can be created.

Creating functional patterns is possible

Excimer radiation can be shaped with mask in the range of µm with the help of masks. On the one side this can enable processes, in which only selected areas of already processed chips are treated while other, sensitive areas are not affected.
In addition, it is even possible to create organic semiconductor components like transistors while treating a hydrophobic layer on the substrate with an excimer light pattern. Afterwards a metal nano-ink is applied, which is only attached to the areas illuminated before. This pattern then form the organic semiconductors as for example published by Takeo Minari.

Excimer Application Laboratory

As part of the portfolio of solutions that are currently offered by USHIO, customers are able to utilize an in-house, bespoke Excimer Application Laboratory to test Excimer applications, hone application designs, achieve insight and technical knowledge, and pave the way for ground-breaking innovation within Excimer applications.
For more information on how USHIO can collaborate and work together with you to achieve excellence through use of the Excimer Application Laboratory, please contact Mr. Andreas Schäfert at excimer@ushio.eu

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About USHIO:
Since its inception in 1964, USHIO has garnered a worldwide reputation as the specialist in industrial light sources. Covering the entire light spectrum from Ultraviolet to Infrared, USHIO solutions can be found in diverse range of products from cinema screens and water dispensers to life-saving medical devices, and are used in the production of the latest smartphones and the testing phase of space exploration. USHIO is proud to contribute to a more advanced, happier and healthier society.
However, it is not products that USHIO specialises in, but rather solutions. USHIO has amassed a wealth of in- house specialist knowledge and localised expertise, irrespective of its global operation, which is paramount for providing lighting solutions that travel way beyond expectations.
Simplifying complex processes and fostering partnerships for the long haul is at the heart of what we do. Our tried and tested approach is to listen to your ideas and to work together with you in developing world-class bespoke solutions. Our technology enables.

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