

Press release XXIV / 2015

On the road to efficient fiber composite lightweight engineering with laser and plasma

As a leading laser application Fraunhofer institute the IWS is expanding its activities in the field of fiber composite lightweight engineering. Yet another reason to present the latest IWS research results at the trade show "Composites Europe"! A particular highlight for visitors is the high speed joining process of thermoplastic polymers using reactive foils.

In the blink of an eye the joint between a thermoplastic sample and a metal, ceramic or polymer component is completed. The application of reactive multilayer systems enables these fascinating processing speeds. The foils with a size of 20 to 100 µm are positioned between the parts to-be-joined. By means of local activation by electric spark or laser pulse the single layers of the RMS chemically react with each other. This reaction releases a defined energy quantity and fuses the joining area of the thermoplastic component. The joining pressure applied enables a reproducible joining of the component.

To obtain a good adhesion of the thermoplastics an optimized surface pre-treatment process is necessary. Here we can rely on the comprehensive experience of the IWS scientists in the team, "Adhesive Bonding and Fiber Composite Technology". Apart from the fine cleaning and chemical activation by plasma treatment, the macroscopical structuring process shows impressively positive effects to increase the joint strength. Here IWS scientists employ the flexible tool "Laser" to substitute complex mechanical or wet-chemical processes.

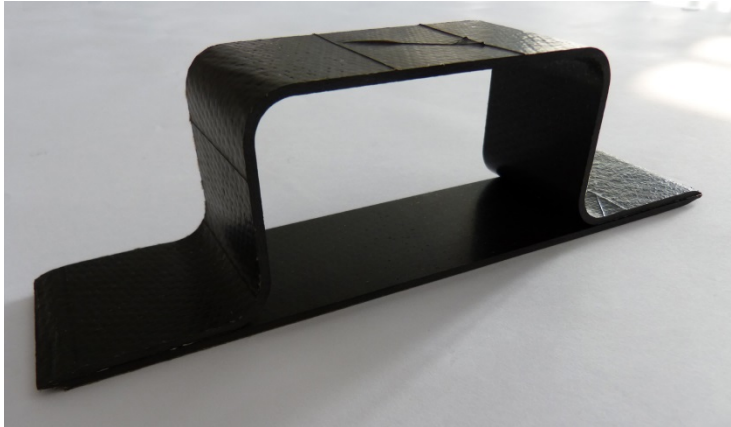
remocut®-technology

Modern high-performance lasers are able to structure surfaces of components in a fast and flexible manner. If processing speeds of several centimeters per second are to be achieved a brilliant continuously emitting laser beam is guided via beam scanning optics. It directs energy via quickly tiltable mirrors on the surface so that material can be removed with a speed of 10 meters per second. Depending on cycle numbers this technology enables the generation of macro structures or even complete laser cuts. The promising cutting results are being presented at our trade booth.

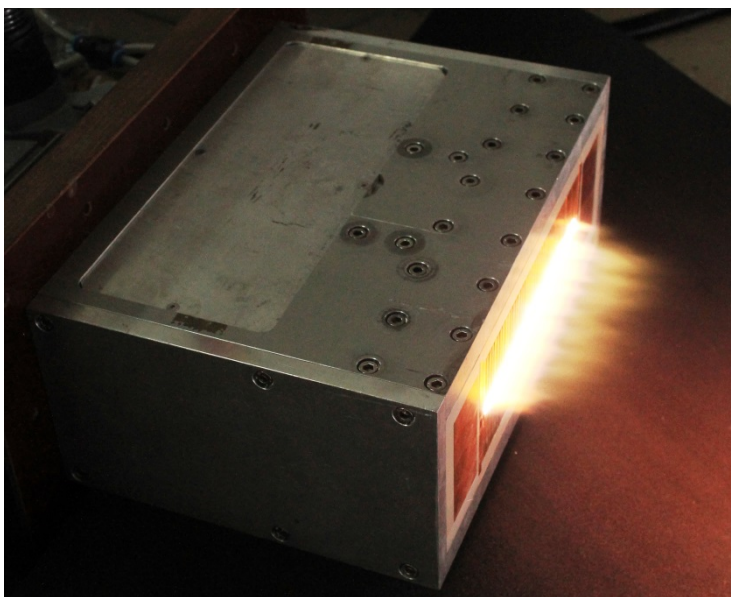
LARGE: Plasma – Pre-treatment for large areas

Commercial plasma sources for the pre-treatment of polymer and metal surfaces can usually process widths of only a few centimeters. The irresistible trend to mass production includes increasing requirements with respect to highly productive surface treatments and joining technologies. To answer these demands scientists of the IWS business unit, "Chemical Surface and Reaction Technology" have been developing a large surface plasma source. By means of this source it is possible to pre-treat large areas, e.g. CFRP structures of 50 meters per minute at a width of up to 35 centimeters.

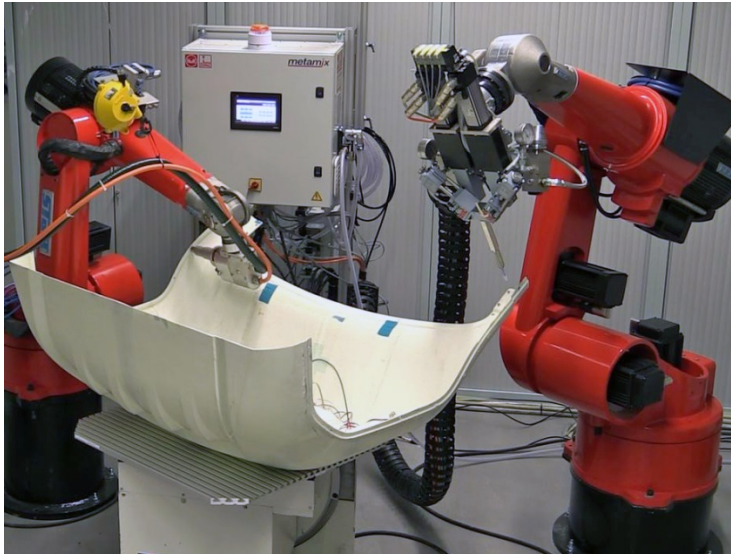
Visit us at the "Composites Europe" trade show in Stuttgart (September 22 – 24 , 2015) at the joint booth of Carbon Composite e.V, Hall 5, Booth D02.



CFRP profile, joined with reactive multilayer systems (RMS)
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LARGE plasma source, width: 150 mm, plasma: Ar-N₂
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Automated joint pre-treatment by plasma and adhesive applications
Material: glass fiber reinforced polypropylene
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