



## FUNCTIONALIZATION OF THERMOSETTING COATINGS WITH VCSEL

### Task

Currently, the demands upon functional layers, such as high wear and corrosion resistance, low friction coefficient and high hardness, increasingly exceed the properties of base materials. Therefore, layers, either similar or dissimilar in type, are applied to the base material in order to achieve the required properties. Frequently, these layers must be thermally post-treated after being applied. Laser-based thermal post-treatment makes it possible to functionalize these layers in-line, that is to dry, to cure, to sinter or to crystallize them. In addition, with the so-called Vertical Cavity Surface Emitting Laser sources (VCSEL), it is possible to adjust the intensity distributions according to the application.

### Method

In initial experiments, a VCSEL module was used to dry and cure thermosetting coatings on steel substrates. The module has a maximum output power of 2.2 kW, a beam exit area of 40 x 55 mm<sup>2</sup> and a total of 12 individually controllable rows of emitters. Both the coating and the laser processing were carried out under a flow box in order to prevent possible contamination of the sample surface with impurities.

### Result

The experiments show that VCSEL modules can be used for the drying and curing of thermosetting coatings. Moreover, the wear coefficient can be reduced by a factor of six as compared to furnace-based processes. The reasons for this are currently being investigated. The area rates achieved so far are in the range of some cm<sup>2</sup>/s.

### Applications

This VCSEL-based process can be used, in particular, to functionalize thin large-area, thermosetting coatings.

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### Contacts

Susanne Wollgarten M.Sc.  
Telephone +49 241 8906-372  
susanne.wollgarten@ilt.fraunhofer.de

Dr. Jochen Stollenwerk  
Telephone +49 241 8906-411  
jochen.stollenwerk@ilt.fraunhofer.de

1 VCSEL module with separately controllable emitter rows.

2 Surface irradiated, coated steel sample.