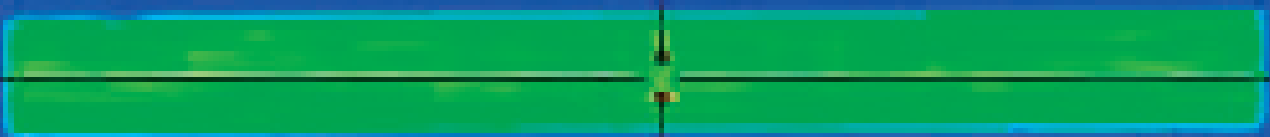




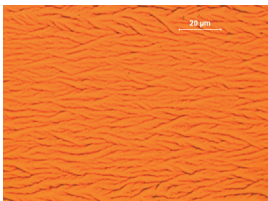
## Lateral and Solid Phase cw-Laser Crystallization



False colour beam profile of LAVA CW Laser Optics

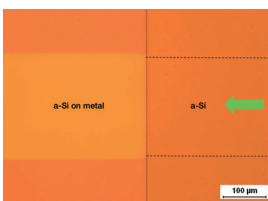
# LAVA CW Laser Optics for a-Si Crystallization

LCD and OLED displays require high performance thin film transistors to switch the display pixel matrix. Also silicon thin film solar cell improvements are focused on the crystallization of a thin silicon layer which is used as a seed to grow 2µm thick silicon to enhance the efficiency to 10% and above. Applying continuous wave (cw) 532nm laser radiation by fast line beam scanning gives access to equivalent pulse duration from 10-50µs. The full melt crystallization allows to obtain nearly single crystal film performance but the heat transfer into the glass requires designs which compensate thermal stress. The glass heating becomes uncritical at high scanning speed of 2-3m/s and power density of 300-400kW/cm<sup>2</sup>. The process is described as "cw laser lateral crystallization" (CLC).



50nm a-Si film after 120kW/cm<sup>2</sup> @ 650mm/s, 532nm exposure.

The power density can be reduced to control the temperature of the film below the Si-melting temperature and initiate solid phase crystallization (SPC). The mobility of the electrons is increased by a factor of 10-20. The benefit of this process is that metal electrodes below the Si-film are not thermally damaged. So-called "bottom electrode" designs are involving less process steps and lower manufacturing costs and have a great importance for future OLED-TV applications.



Solid phase crystallization (SPC) in 50nm a-Si Film @ 50kW/cm<sup>2</sup> and 490mm/s scan speed.

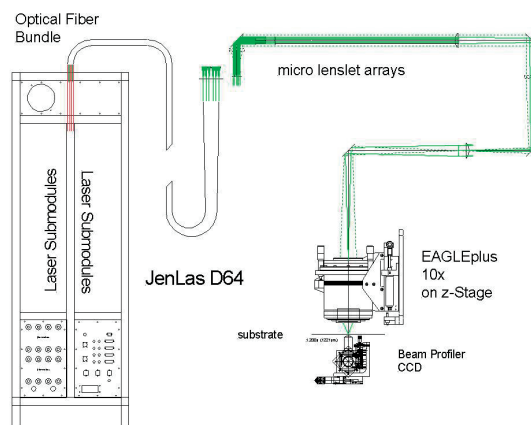


JENOPTIK | Lasers & Material Processing  
 INNOVAVENT GmbH, Bertha-von-Suttner-Str. 5  
 37085 Göttingen, Germany  
 phone/fax: +49 (0) 551 90047-0/19  
 www.innovavent.com  
 info@innovavent.com

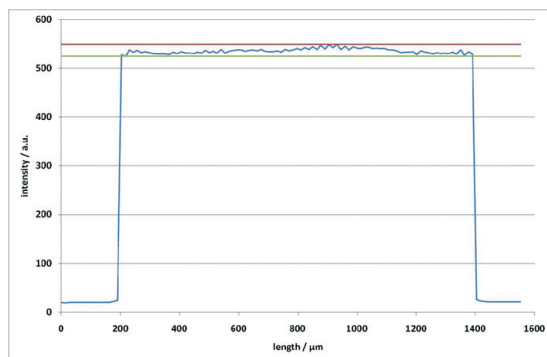
The concept for the LAVA CW Laser Optics is based on multiplexing of several 532 nm medium power cw JenLas® D2 (5-10 W) lasers by fiber coupling and processing the incoherent beams in a micro lens array homogenizer. The homogenized beam (uniformity in long axis 1σ <1.5%) provides excellent power stability (<1%) and is well suited for CLC and SPC processing.

## LAVA 64CW Specifications

Wavelength	532nm
Line geometry (FWHM)	1.2 mm x 30-35µm
Power density	100kW/cm <sup>2</sup>
Laser power	64W
Attenuator	polarization type, 10-100%
Beam profile measurement	CCD camera with microscope objective
Laser shutter	mechanical 5-10ms



LAVA 64CW LASER OPTICS with JenLas D64



LAVA 64CW 1.2mm long axis: 1σ=0.91%, pv=4.4%.

Asia: OPTOPIA Co., Ltd.  
 phone: +81 44 812 5911  
 www.optopia.co.jp, sales@optopia.co.jp  
 USA: Jenoptik Laser Technologies  
 phone: +1 248 446 9540  
 www.jenoptik.com/lm