

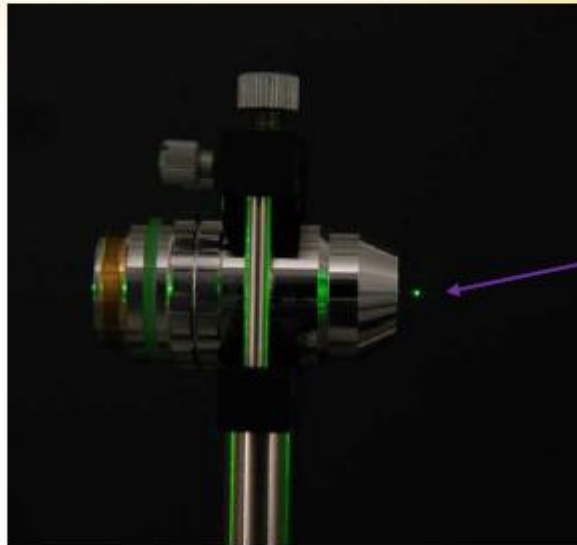
## Sub-nanosecond lasers application review - July 2013

[www.teemphotonics.com](http://www.teemphotonics.com)

### Applications features overview

- **Laser characteristics :**
  - > High peak power / Short pulse
  - > Wide range of performances in UV&DUV
  - > Cost effective and reliable
  - > Compact and air-cooled
- **Favorite playgrounds:**
  - > Industrial environment
  - > High quality sub-mm scale processing
  - > High 3D resolution ( $\mu\text{m}$  scale texturing, selective removal)
  - > NL interaction driven processes (Supercontinuum, TPA)

## The key capability



25 $\mu$ J@532nm  
Tp = 400ps  
NA = 0.2

Stable optical  
breakdown in  
air

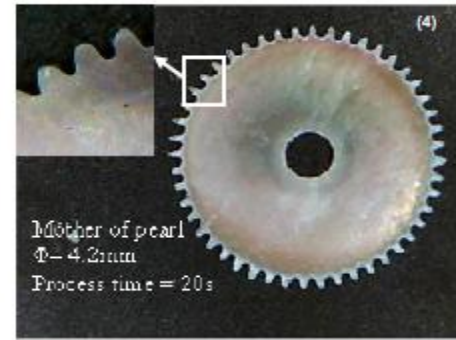
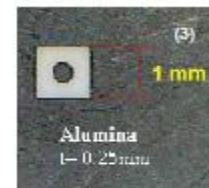
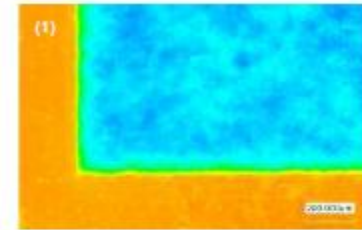
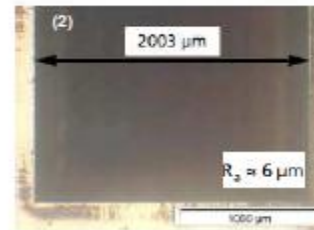
Sub-nanosecond lasers are able to generate **non linear laser-matter interaction** within **standard experimental conditions** in the way femtosecond lasers do!

## Machining hard materials

- Precise machining and good removal rate demonstrated for virtually all types of oxides, diamond-like structures, ceramics, hard metals...

### Applications / Markets:

- > Processing of **natural diamond, PCD, CVD**
- > Machining of **alumina mother-of-pearl, ceramics**
- > Hard metals like **SiC, titanium, tungsten,...**



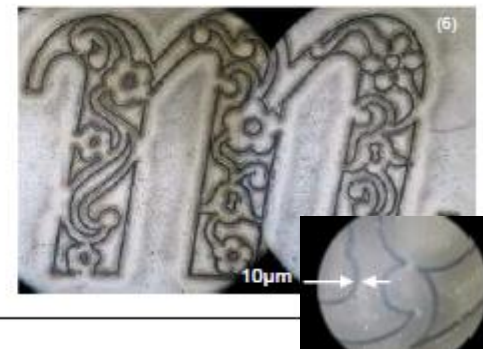


## Processing transparent materials

- Fine machining of glass -  $\mu\text{m}$  scale chipping
- Controlable inner marking with no micro-cracks in transparent media (crystal, glass, polymers)

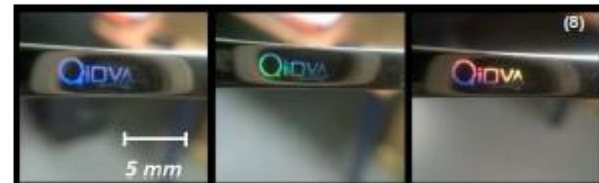
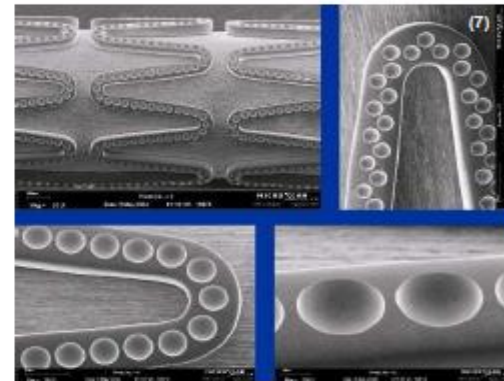
### Applications / Markets:

- > **Thin glass plate cutting** (touch-screens, biological applications)
- > **Bulk marking transparent materials :**
  - Ophthalmic glasses for **traceability** purpose (CR39, PC, 1.67)
  - Semi-invisible marks for anti-counterfeit application



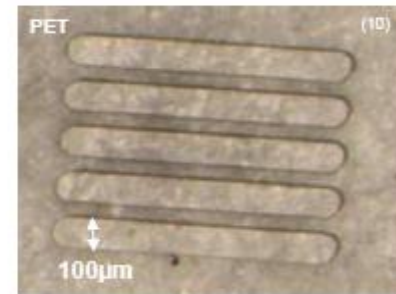
## High-end metal processing

- Precise machining thanks to low HAZ
- Colour marking or soft black marking on metals
- Applications / Markets :
  - $\mu\text{m}$ -scale surface structuring of metals, ceramics, polymers
  - Deep scribing of metals without deformation or cracks
  - 'Soft touch' black marking on shiny metals
  - Colour marking with nanoripples



## Controlling heat input

- Improved quality compared to existing ns laser based processes
- For sensitive materials or substrates
- Applications / Markets :
  - > Micromachining of **small metal parts** without carbonization or fissure
  - > Multilayers **selective removal** (TCOs, OLED, CIGS)
  - > **'Cold'** processing of polymers
  - > **Marking** on semiconductors or sapphire wafers





## Offering cost-effective UV solutions

- For industrial environment
- Wide range of applications
- Drastic reduction of COO compared to excimer lasers

- Applications / Markets :
  - > **Photoluminescence** (UV LED, AlGaN-HEMT, LIF,...)
  - > **PCB** repair
  - > **LCD/FPD** panel repair
  - > Biomedical ( $\mu$ -dissection)
  - > Excimer lasers replacement market



- Key parameters : cost efficiency, high peak power

## Conclusion and perspectives

### **Picolasers can offer picosecond class laser solutions at nanosecond economics**

- Market evolutions increasingly point towards such laser solutions, as new players are entering the game
- Qualified applications fields continuously expanding, with a wide range of industries already penetrated :
  - > Automotive industry with metal surface patterning
  - > Photovoltaics with thin-film cell patterning
  - > Electronics and displays with PCB, LCD and FPD repair
  - > More to come...



안녕하세요! OptiLase 입니다.

OptiLase는 Optical engineering 과 Laser를 기본 아이템으로 하여 Laser를 포함한 다양한 Light Source 및 광학부품, 광학시스템을 공급하고 있습니다.

주요 아이템은 아래와 같습니다.

#### Laser (He-Ne, He-Cd, Ar, YAG, Fiber, CO2, Excimer 등..)

- He-Ne Laser
- He-Cd Laser
- Ar / Kr Laser
- Ar/Kr Laser replacement
- Diode Laser (375nm – 905nm)
- YAG Laser (1064, 532, 355nm)
- Fiber Laser
- Excimer Laser
- CO2 Laser
- Femto second Laser

#### 광학 부품, 모듈(OEM)

- Mirror, Lens, Beam Splitter, Filter, Polarizers, Multi-element optics, prisms, Windows,
- Laser Optics (OC, HR, Rod, Beam expander & component )
- Objective Lens
- OEM module

#### 매뉴얼 스테이지, 오토 스테이지, 각 종 광학부품 마운트 류

- 매뉴얼 스테이지, 오토 스테이지, 크로스 롤러,
- 광학 부품 마운트
- 광학 테이블

#### PL, Raman System, Laser application을 포함한 R&D 지원