



光学检测和激光微纳加工研发及产业化

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单微球非接触光学显微镜

2017年：单微球非接触光学显微镜实现产业化

微球光学

系统构建：超分辨微球透镜

➢ 解决微球成像机理及纳米级调控难题

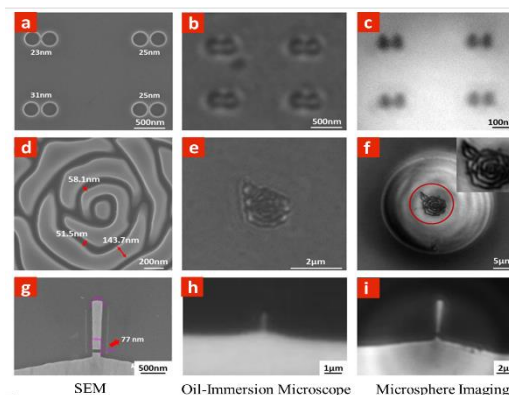
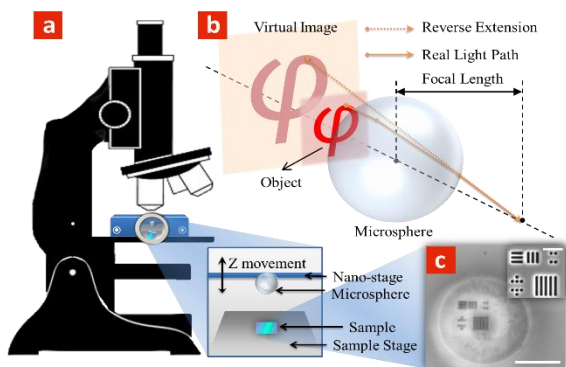
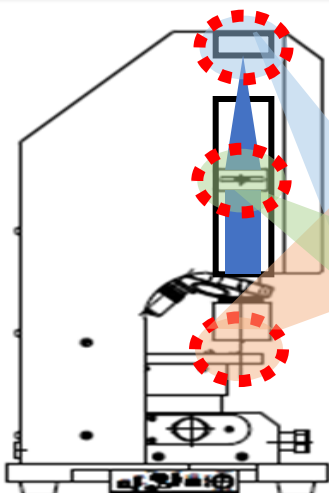
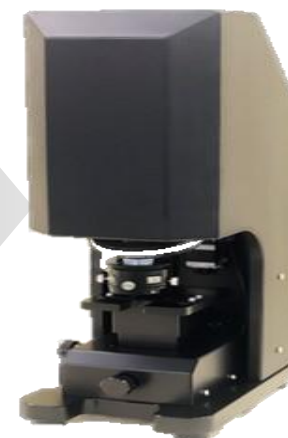
应用拓展：介质微球的聚焦效应

➢ 静态与动态的微球光场调控

检测应用：超分辨成像的信号分析

➢ 解决微小光学信号精确测量问题

产业化



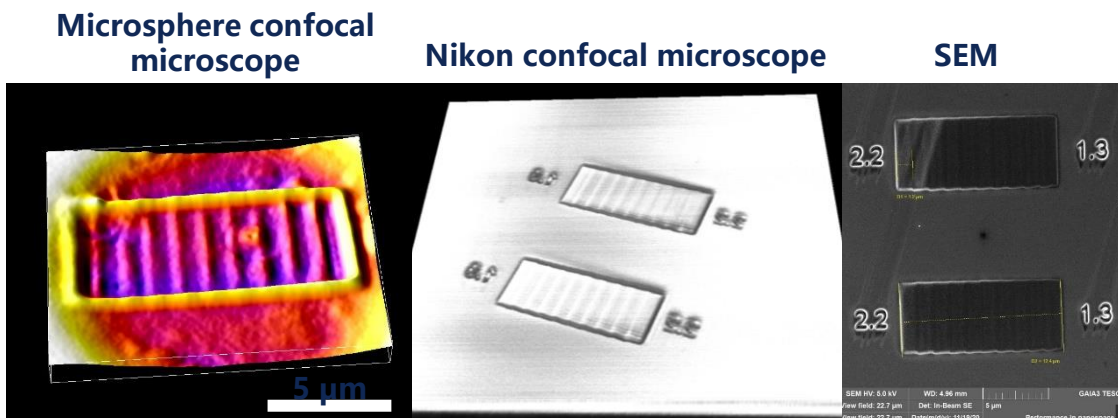
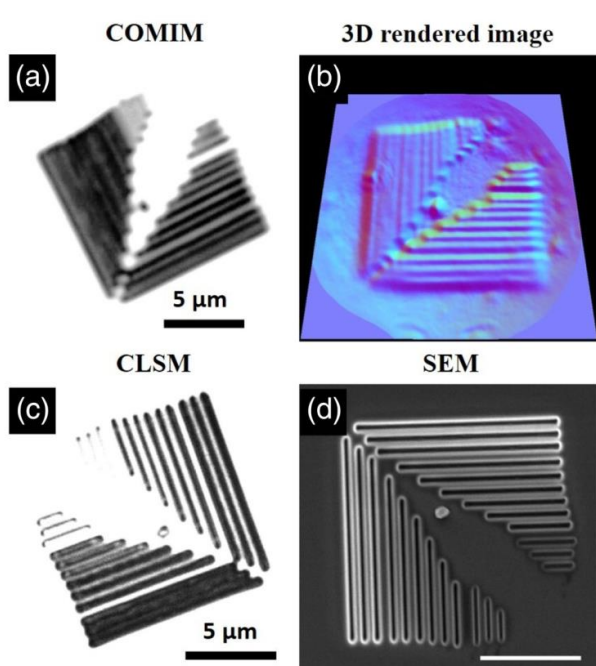
分辨率 137 nm

新加坡光技术有限公司
(2020年被投资人收购,
计划于明年上半年到美国
纽约上市)

微球共聚焦光学显微镜原型机

2021年：微球共聚焦光学显微镜（COMIM）原型机

- 可突破**光学衍射极限**，实现纳米成像能力 分辨率 120 nm
- 可提高**三维成像速度**，提高了微球纳米显微技术在三维成像的应用和推广



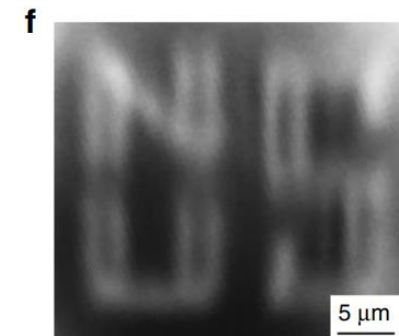
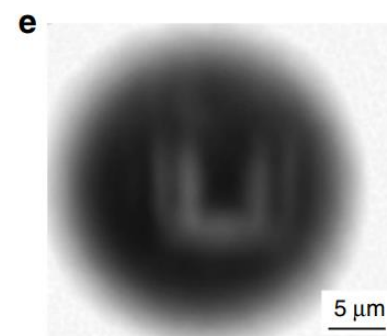
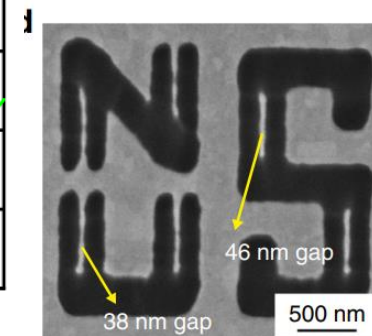
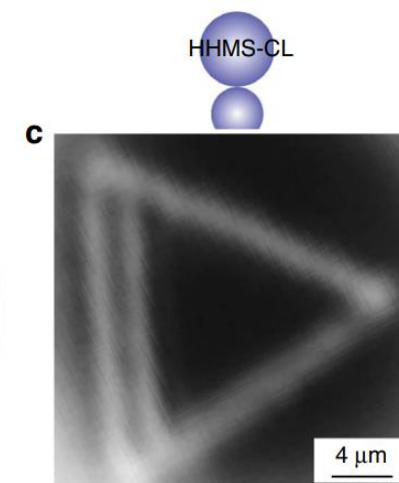
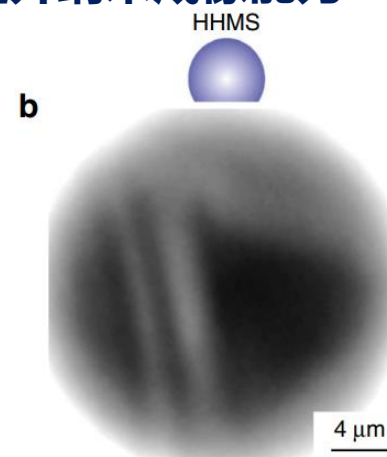
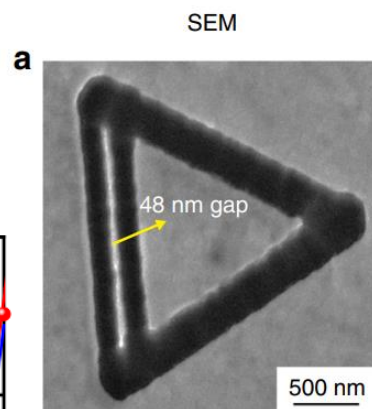
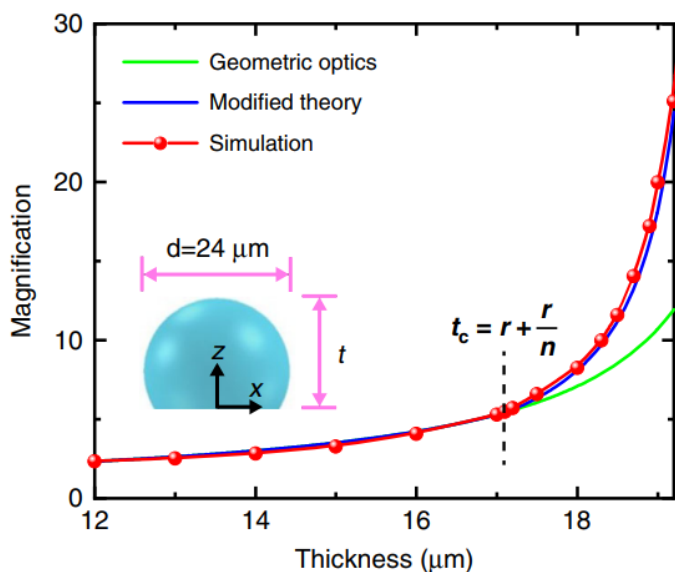
采用逐图扫描方案，比商用尼康激光共焦显微镜，COMIM只需要**11%的时间**来完成三维(3D)扫描图像
计划在厦门产业化

下一代工程化微球光学显微技术

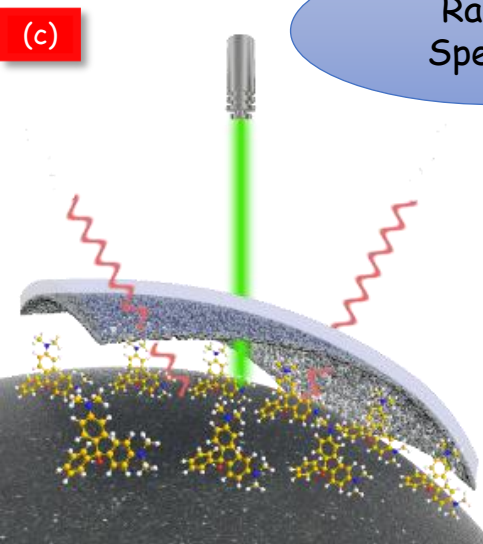
2023年：工程化微球光学显微技术的基础研究

- 超半球：突破单个微球成像**放大倍率**，提升纳米成像能力

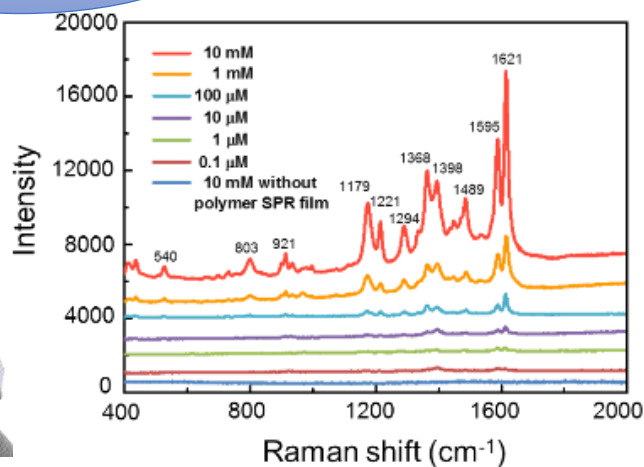
分辨率 亚50 nm



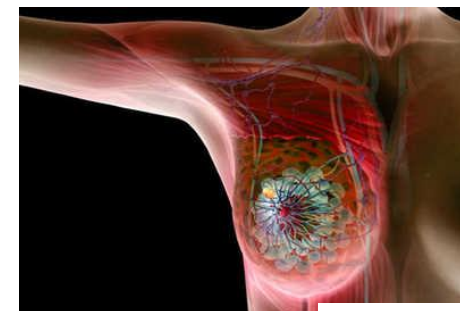
表面增强型Raman光谱仪原型机



Raman Spectra



Optical Sensing (光学检测)



Cancer



Water

表面增强型Raman光谱仪原型机



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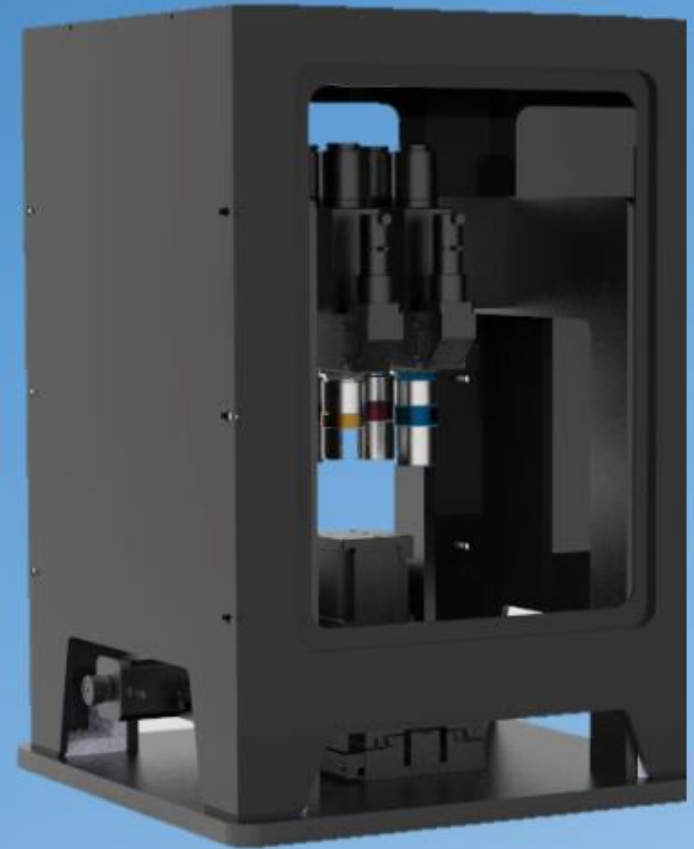


A revolutionary Module-Based Optical Microscope

origin
INSTITUTE OF OPTICS

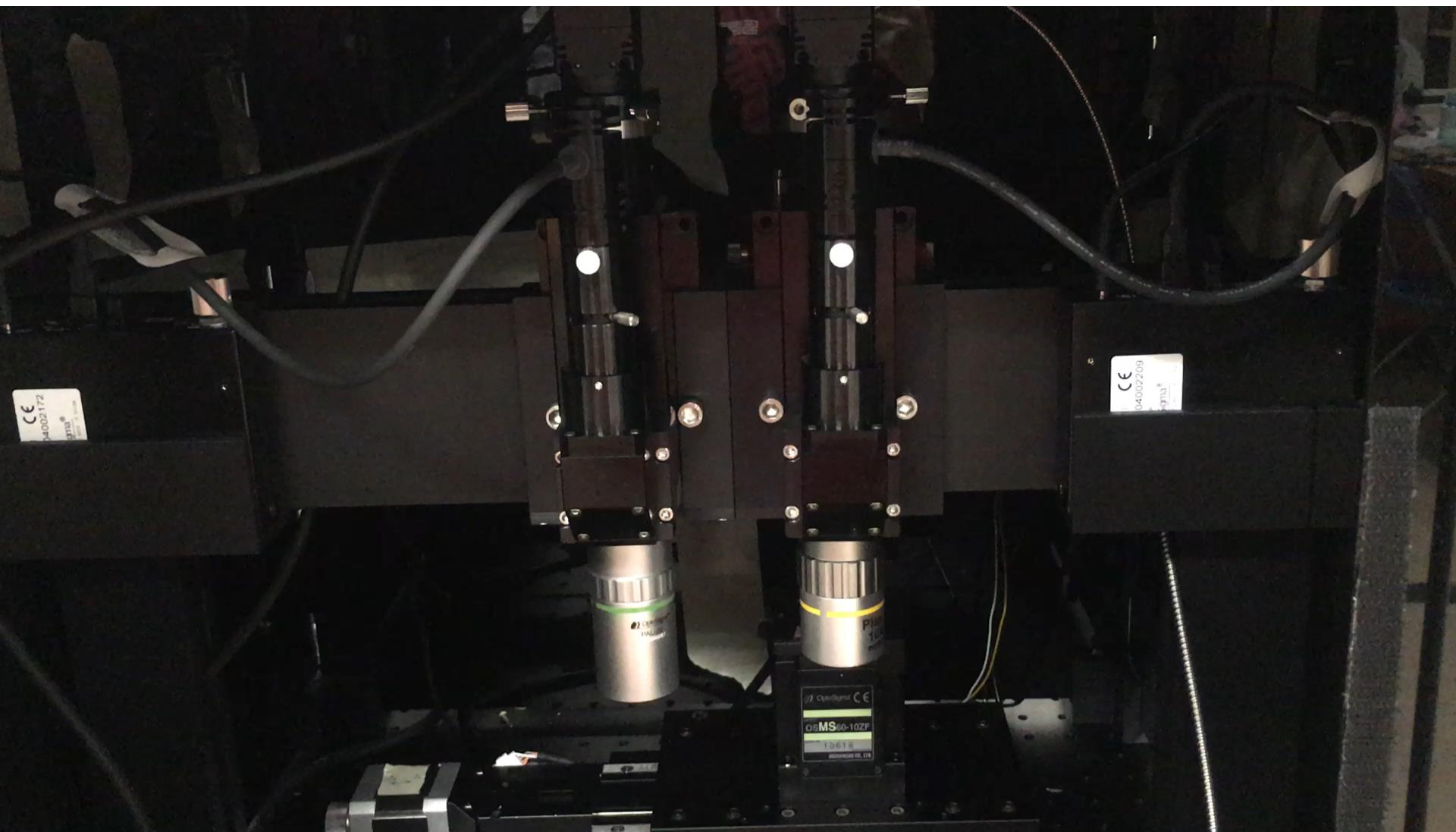
OPTO SCIENCE MULTISCOPE

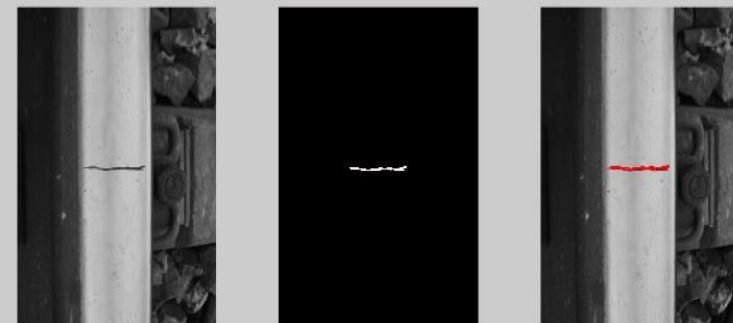
Revolutionising Microscopy



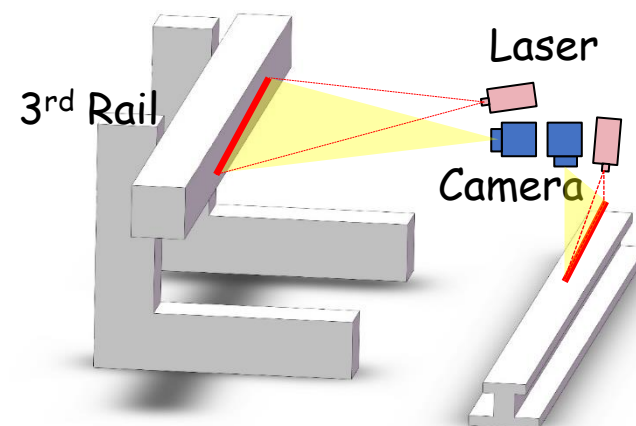
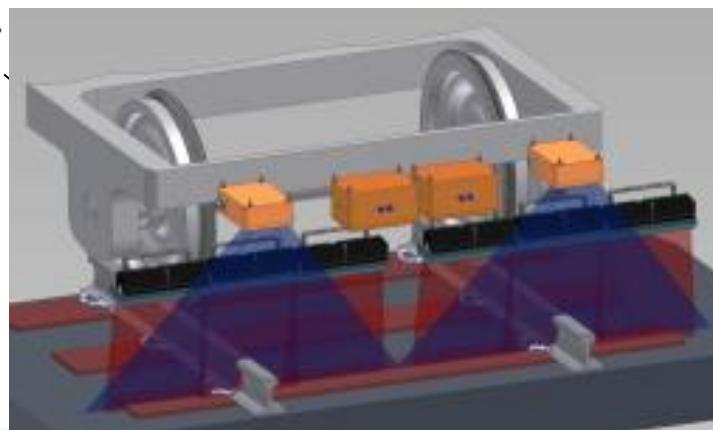
Opto Science Pte. Ltd.

A revolutionary Module-Based Optical Microscope

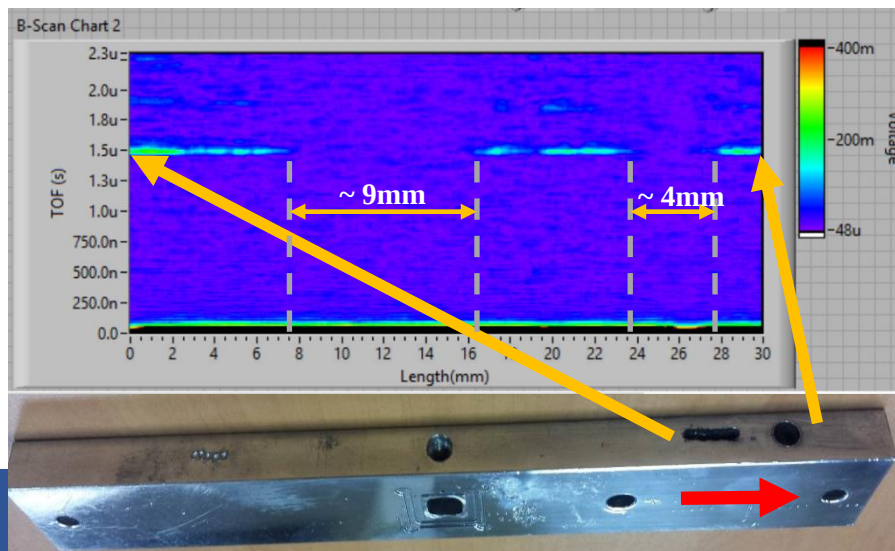
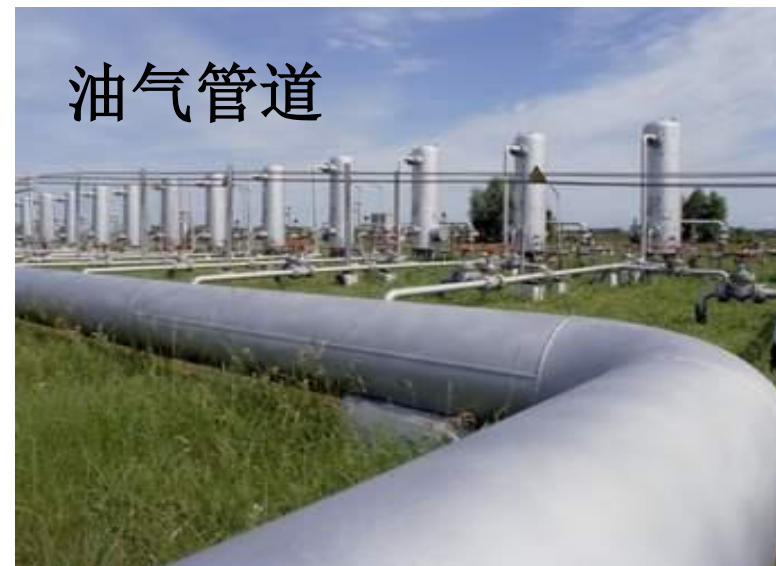
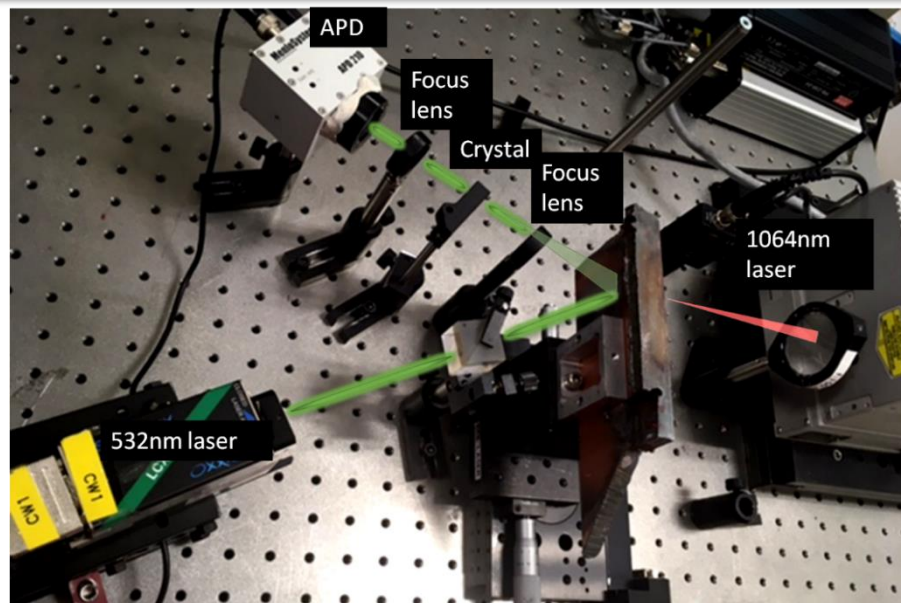




铁轨表面微裂纹光学成像检测



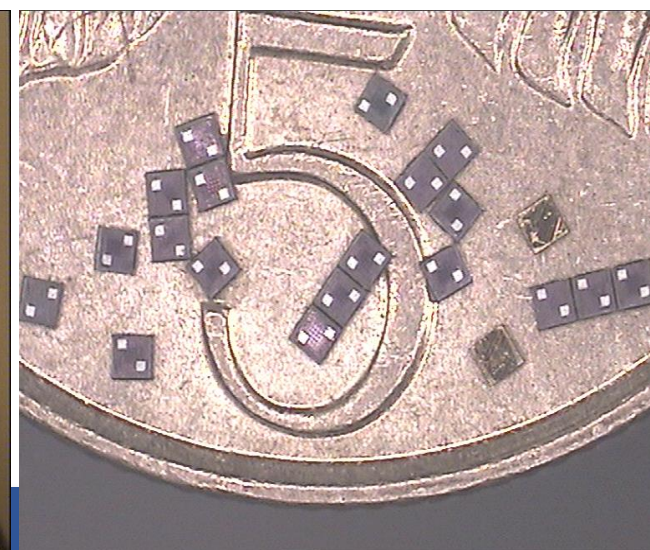
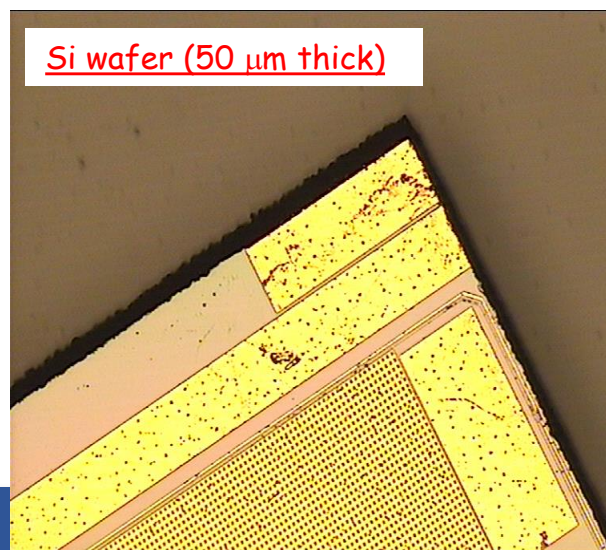
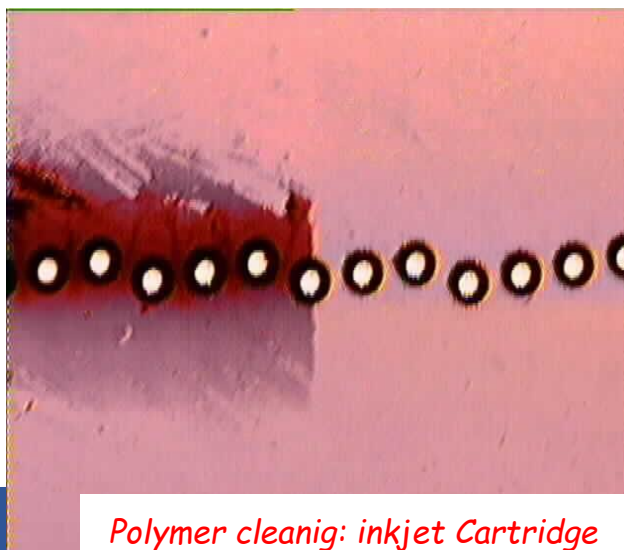
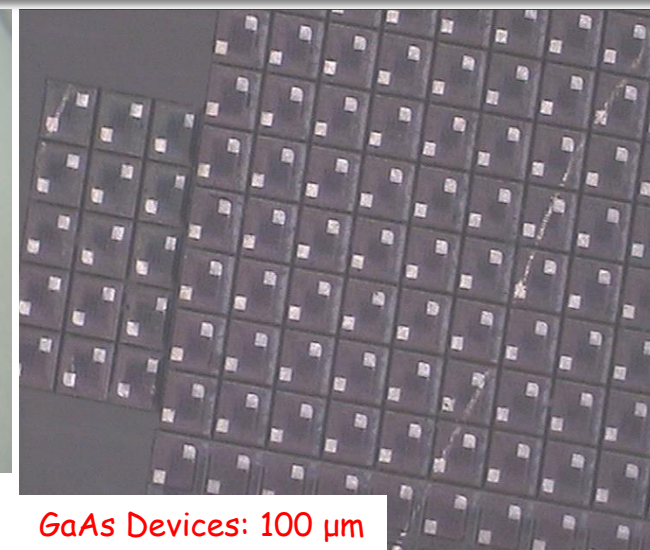
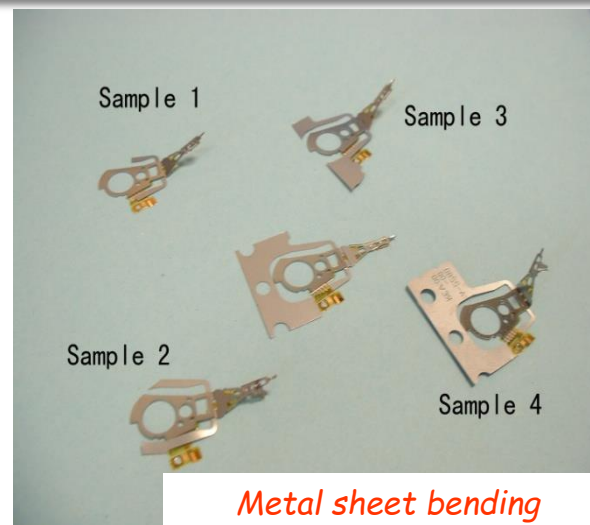
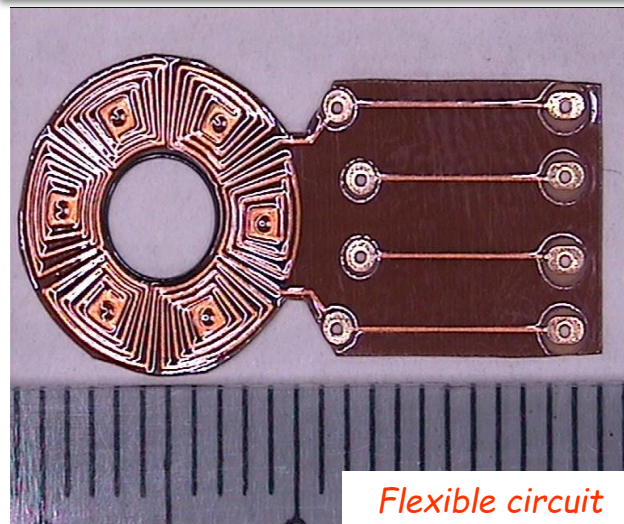
激光超声检测钢铁构件内部微裂纹



激光微加工 (微电子工业)



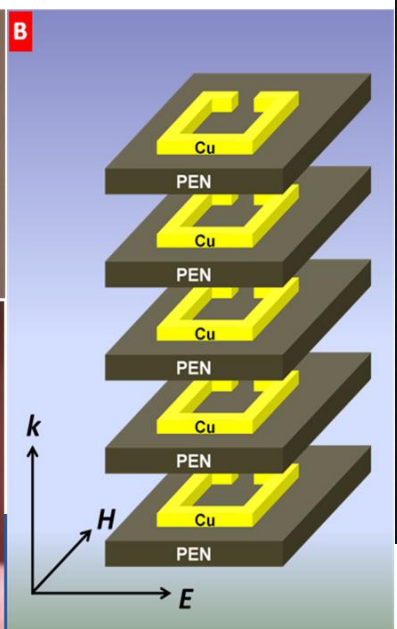
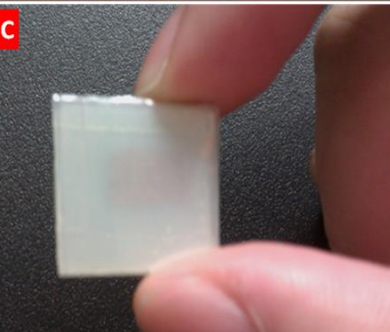
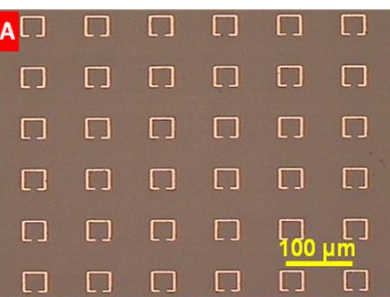
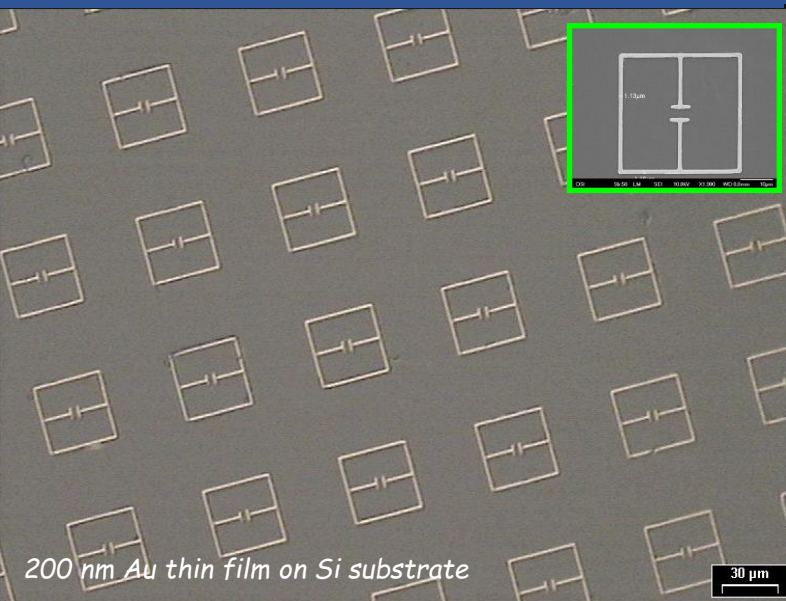
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激光微加工（微电子工业）



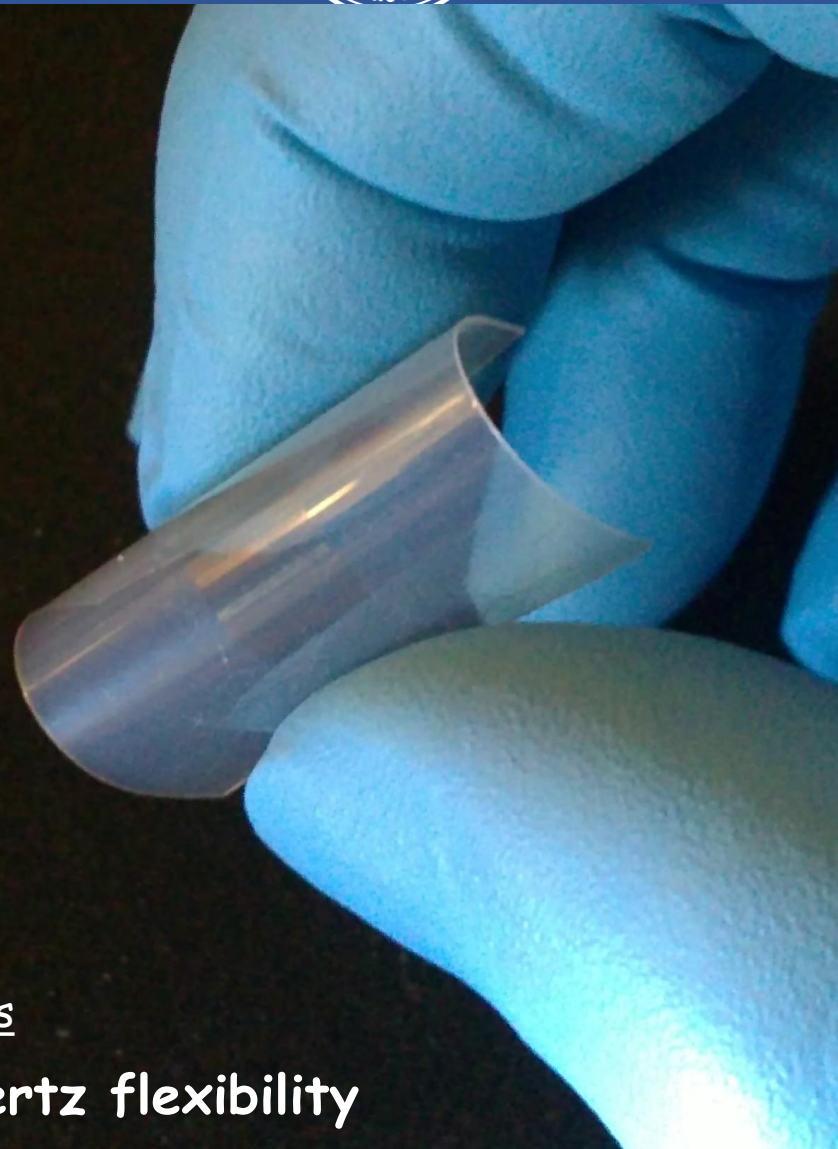
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Metamaterials

Terahertz flexibility

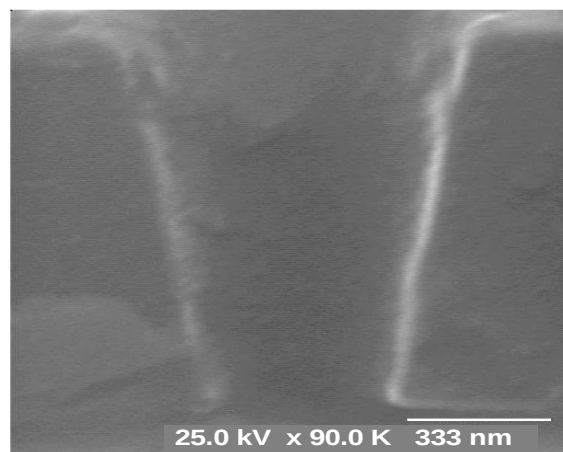
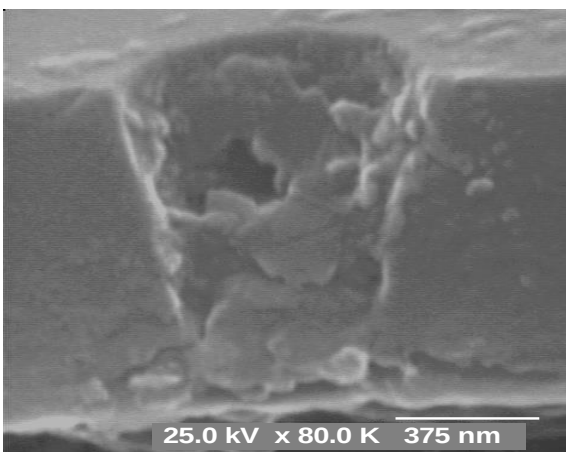
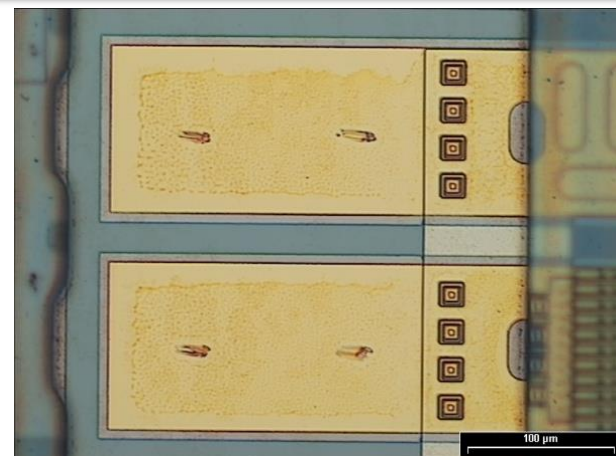
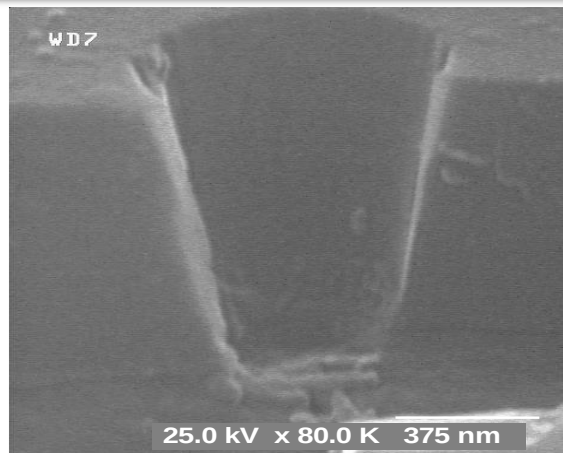
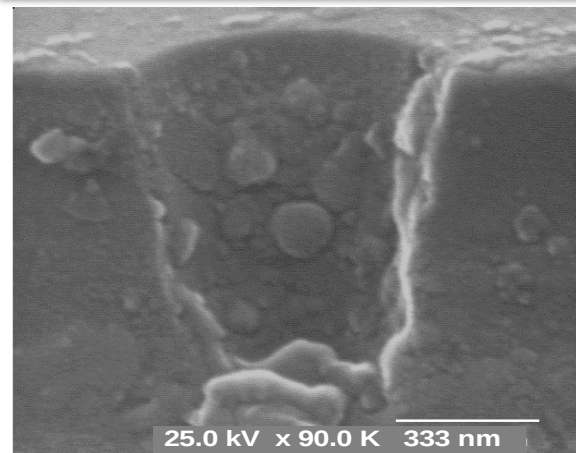
**Research Highlight, Nature Photonics Vol. 5 (2011) page 251*



激光清洗



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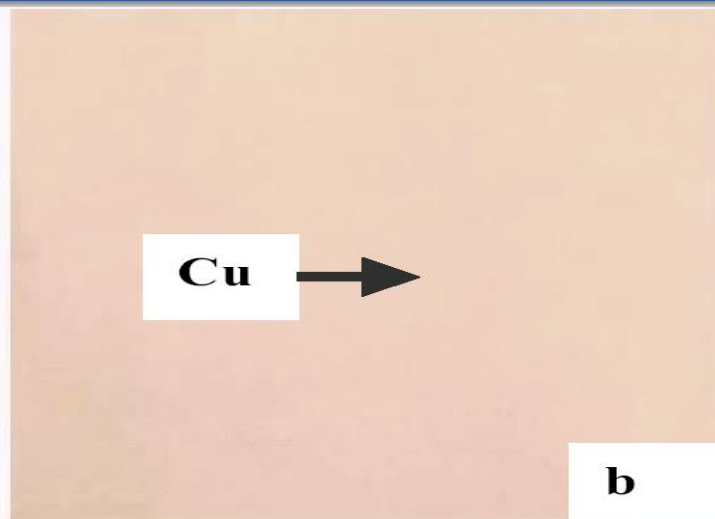
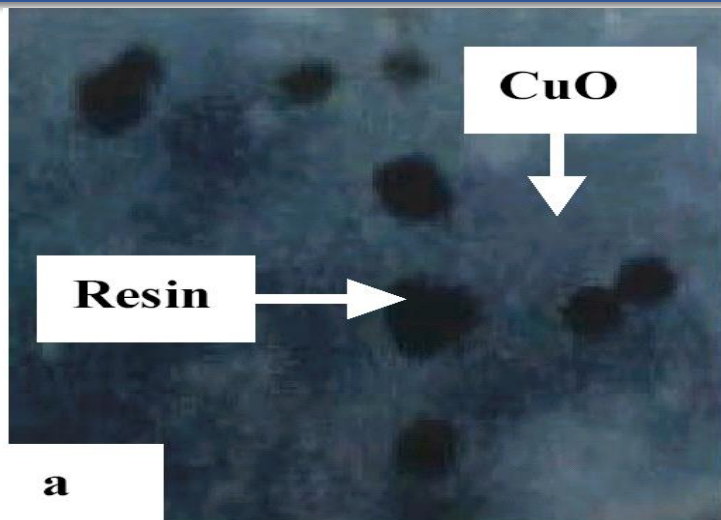
IC Via hole

IC chip

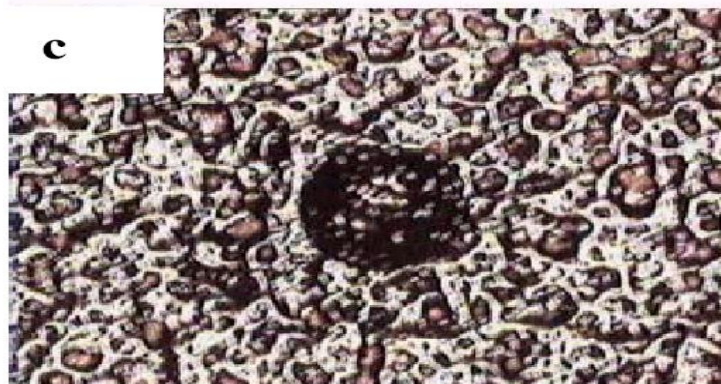
激光清洗



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6 mm



600 μm

激光清洗



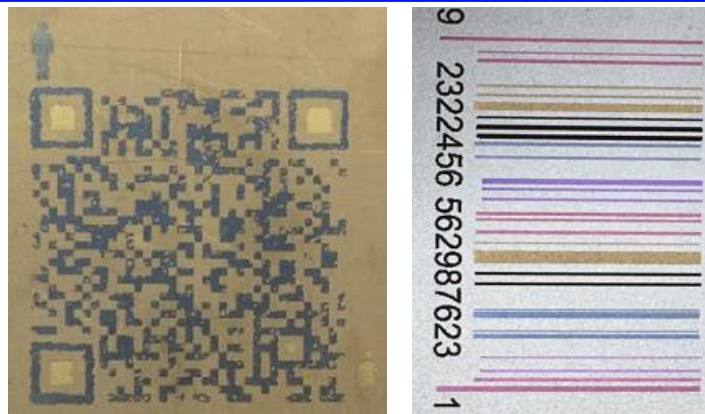
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金属激光彩色打印



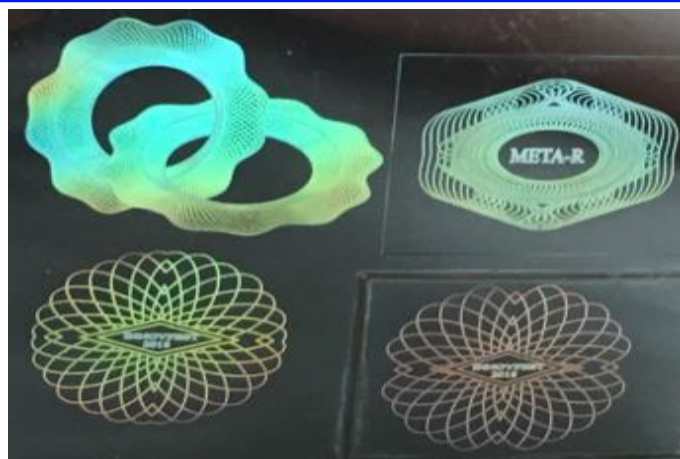
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彩色条码、二维码
QR code and bar code



装饰、商标、徽标图案
Decorative artwork and logos



防伪Anti-counterfeiting

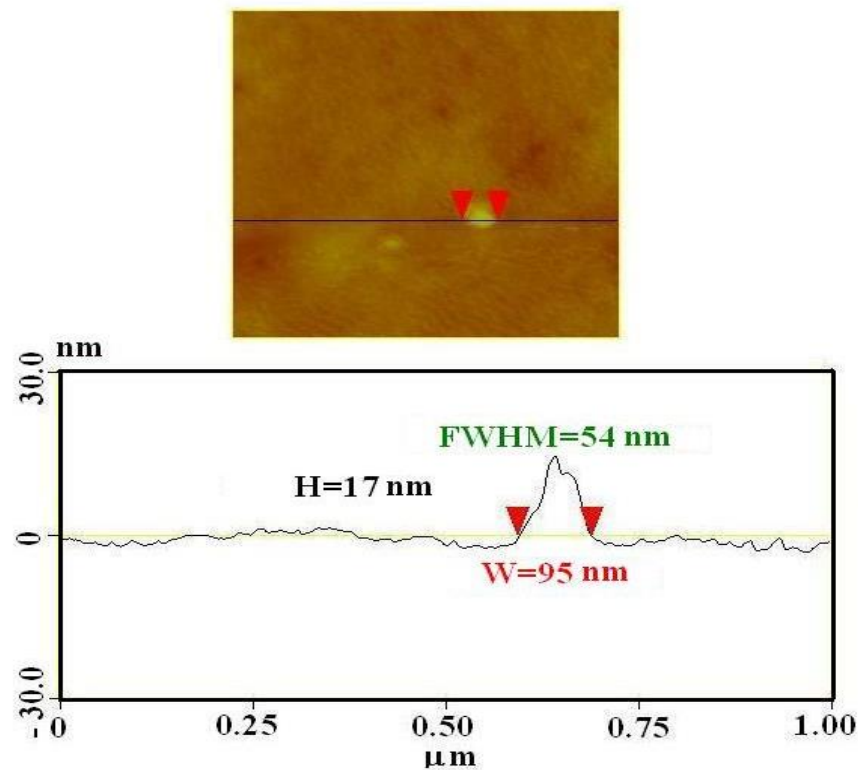
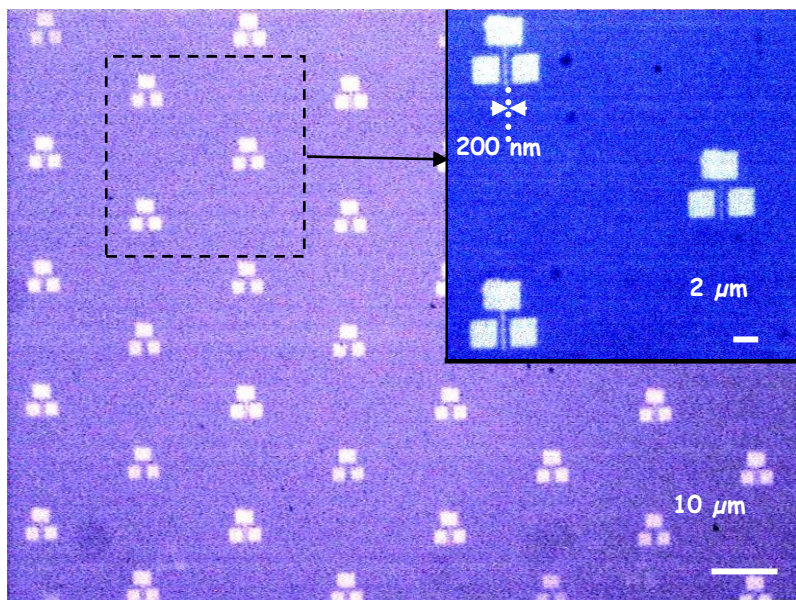


个性化首饰定制 Customized jewelry



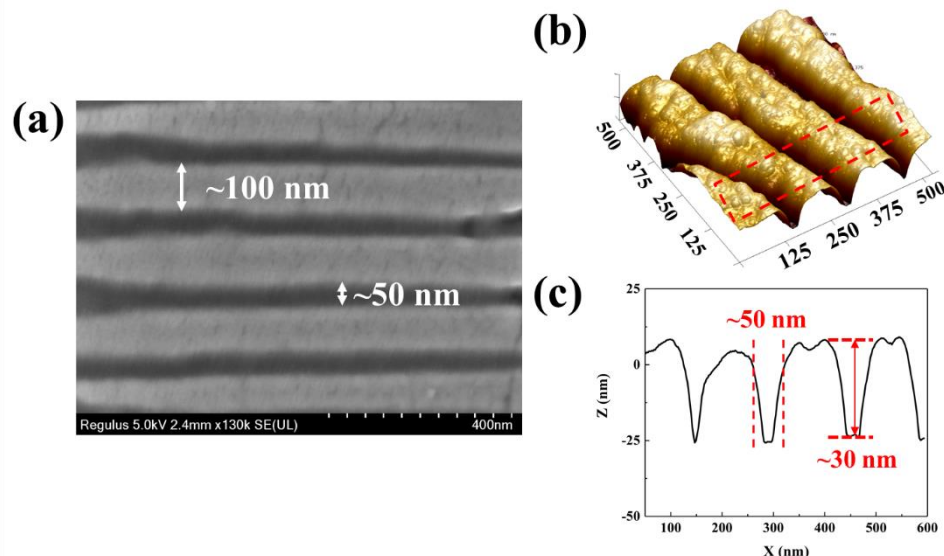
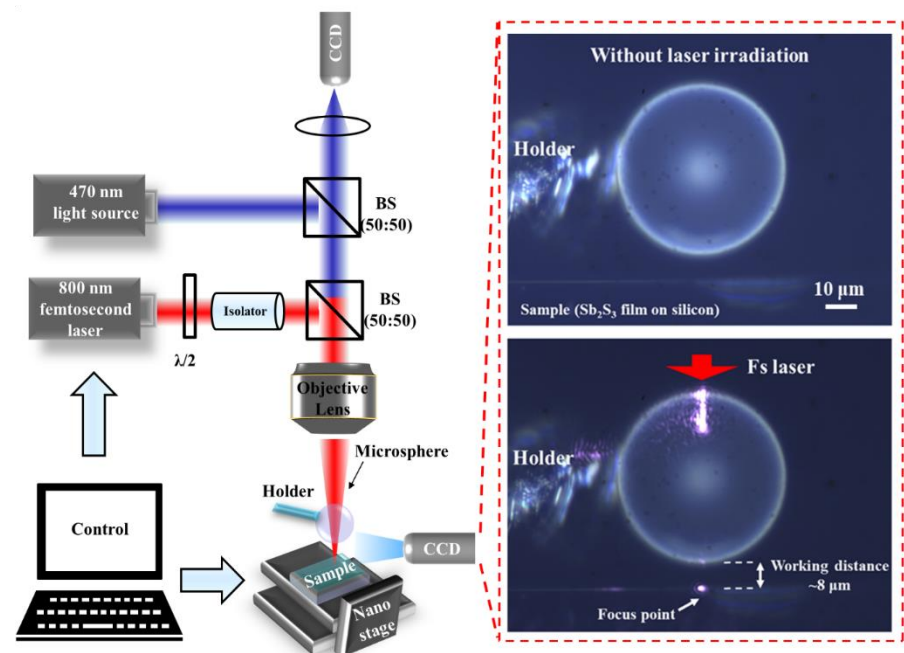
Fs laser MLA Nanolithography: 50 ~ 200 nm

MLA diameter: 23 μm



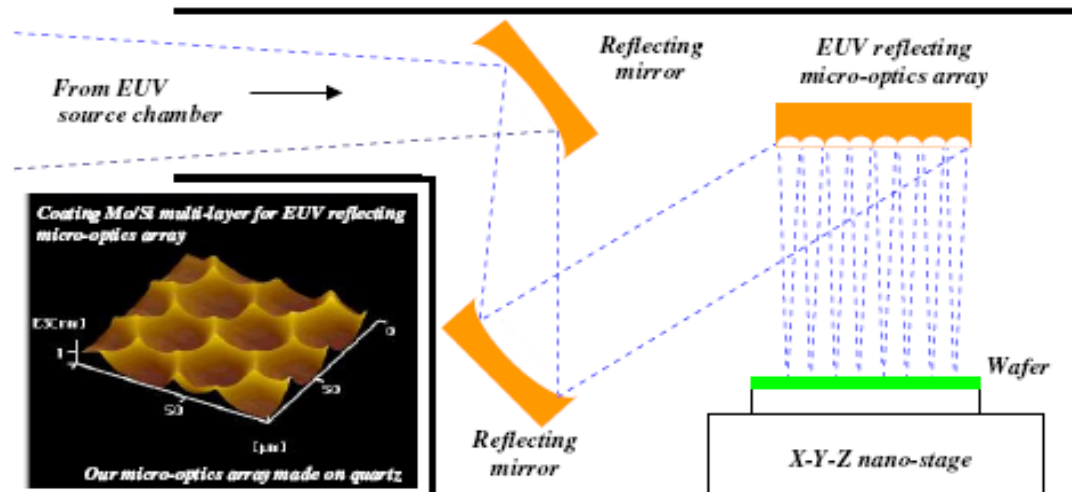
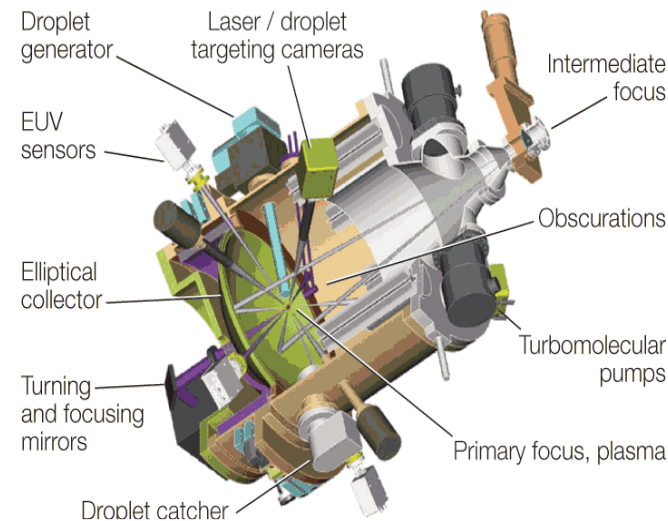
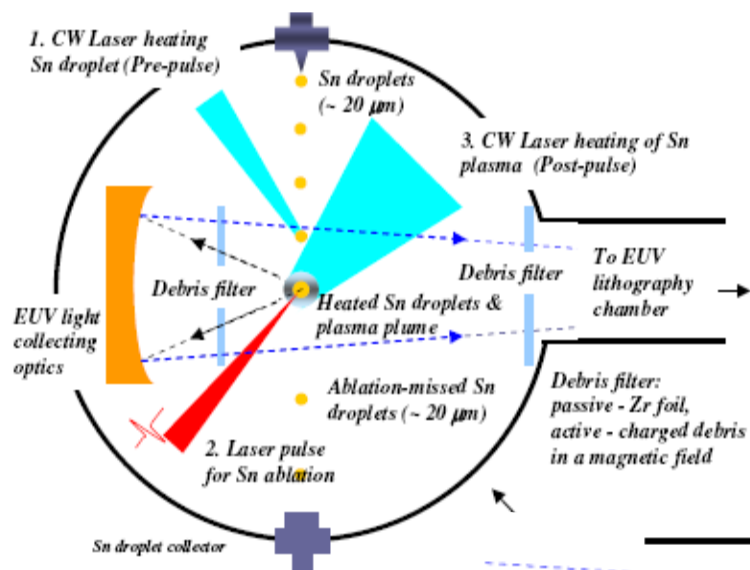
GST phase change materials

Microsphere Fs Laser Surface Nano-structuring in Far Field: ~ 30 nm





激光纳米光刻（计划开展EUV光源研究）



谢谢！