

Scientific Publications demonstrating the efficiency of TEEM PHOTONICS Microfab3D system:

Please find below a list of international publications done in the past years explaining **the efficiency of the TEEM PHOTONICS lasers** (ex JDSU or Nanolase) for a 2 photons photo-chemical reaction and its **cost effectiveness**.

The power of the advanced software integrated in the TEEM PHOTONICS global solution (applying TSM – Two-dimensional Slicing Method) , resulting of several years of development, is also explained, as well as final customers main concerns and focuses.

1/“Laboratoire de Spectrometrie Physique”- French CNRS and UJF University of Grenoble
 “Department of Mechanical Engineering”- National Taiwan University

- **2009** : P.L. Baldeck, C.-Y. Liao, M. Bouriau, J.-C. Leon, C. Masclet, M. Iosin, T. Scheul, L. Vurtz, G. Vitrant and O. Stephan
"Advances in two-photon nanostructuring of polymers, proteins and metallic materials with Q-switched microlasers" - ISOPL5 Conference

Extracts: “We report on the fabrication of BSA, collagen and mixed 3D structures using a 532 nm-microlaser **Teem Photonics**” “the fabrication of **3D silver micro-objects** using a 1064 nm-microlaser”.....
 “In conclusion, we show that Q-switched Nd:Yag microlasers have a **high two-photon chemical efficiency** that make them **cost-effective laser** sources for two-photon 3D micro/nano fabrication »

- **2007**: C.Y.Liao, M.Bouriau, P.L.Baldeck, J.C.Léon, C.Masclet & T-T.Chung “*A two dimensional slicing method to speed up the fabrication of micro-objects based on two-photon polymerization*” Appl.Phys.Lett., 91, 033108

Extracts: “The single-dimentional slicing method (**SSM**), also known as layer-by-layer method, is generally used to fabricate 3D microstructures”... “ a more efficient than SSM manufacturing approach has been proposed” ...”**TSM** can greatly **reduce the amount of exposed voxels** when fabricating nearly planar regions of microstructures and fabricate all **the needed shapes** even if the shape slope equals zero”...
 “confirm that our approach is **effective** and stands as a good balance between the surface accuracy and the processing efficiency, whatever the origin of the initial model data”

- **2002**: I. Wang, M. Bouriau, P.L. Baldeck, “*Three-dimensional microfabrication by two-photon-initiated polymerization with a low-cost microlaser*” Optics Letters, Vol. 27, No. 15, 2002, pp. 1348-1350.

Extracts: “A very simple and straightforward way to produce intricate 3D structures with high resolution” ...
 “The light source was a frequency-doubled Nd:YAG microlaser from Nanolase JDS Uniphase”
 “We created **polymer microstructures** with our microlaser to illustrate the large range of possibilities offered by the two-photon polymerisation technique”... “makes it **possible to fabricate 3D microstructure of arbitrary complexity**” ... “at **speeds equivalent** to those obtained in other microfabrication experiments that employed **femtosecond lasers**”

2/ "Department of Chemistry & Biochemistry and the institute for cellular & Molecular Biology"
University of Texas – Austin :

- **2006** : Bryan Kaehr, Nusret Ertas, , Rex Nielson, Richard Allen, Ryan T. Hill, Matthew Plenert, and Jason B. Shear
"Direct-write Fabrication of Functional Protein Mtrixes Using a Low-cost Q-switched Laser" Anal. Chem. **2006**, 78, 3198-3202

Extracts: "We report the use of an **inexpensive, small, and "turnkey"** Q-switched 532-nm Nd:YAG laser as a source for nonlinear, direct-write protein microfabrication" ... "extended proteinbased structures can be fabricated with **precise, threedimensional topographies**. As with earlier studies using a **femtosecond titanium:sapphire laser costing more than \$100K** » ... «**Characterization of this inexpensive, low-power source will greatly broaden access to directwrite protein microfabrication.** »

- **2006** - Jason B. Shear:
"Buiding protein microstructures with less expensive lasers" Biophotonics International – May 2006

Extracts: "The emission from a femtosecond Ti:sapphire laser can be used to create miniature structures made of protein that fence in a living bacterium" ... "laser cost upwards of \$100 000""They have shown that similar results are possible with an Nd:Yag Laser that costs roughly \$6000""however the technique requires **high peak power intensity**" ... "the Researchers used a **laser from JDSU of San Jose, Calif**" " As was the case with earlier Ti:sapphire fabrication research, the investigators could build a protein fence around a cultured rat neuron.Corralling the neuron is an important initial step towards the more sophisticated manipulation needed to build a neuronal network"... "they could even enclose free-floating particles in a protein box"