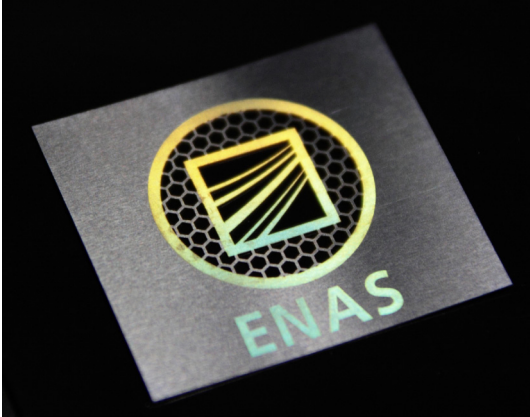# LASER MICROMACHINING OF METALS FOR MEMS / NEMS APPLICATIONS

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Figures: Laser cut Cantilever Structure (left); Decorative coversheet with honeycomb structure laser cut and laser modified surface (right). Photo acknowledgments: Fraunhofer ENAS All information contained in this datasheet is preliminary and subject to change. Furthermore, the described systems, materials and processes are not commercial products.

1. Motivation

The precise processing of metals in the micrometer range plays an important role not only in MEMS/NEMS applications for example for sensors, actuators and mask fabrication. There is also the need for the fabrication of tools for molding, decorative elements and the marking of devices, to name a few. In a layered combination with other substrates, like in the case of sputtered metals on glass, semiconductors, polymers, etc. or laminated metal sheets, a precise, flexible and furthermore selective structuring method is desired.

2. Materials

- Stainless steel
- Molybdenum
- Aluminium
- Gold
- Nickel
- Copper
- Brass

3. Typical Processes

- Cutting
- Drilling
- Ablation
- Surface modification

4. Results and Application

It is demonstrated that different kinds of metals can be cut, drilled and marked in a flexible manner with high quality, sharp and smooth edges, smooth surfaces, no melt and with a minimum of cleaning effort. The realization of sputter masks in 100 µm molybdenum (Fig. 1), cutting of cantilever structures used for actuators (Fig. 3 a) and the cutting of fragile honeycombed structures with the ability of laser surface treatment (Fig. 2 b) are demonstrated. Furthermore the selective removal of metals from different kind of substrate materials is successfully implemented (Fig. 3).

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