

## **Picosecond laser micromachining of nitinol and platinum-iridium alloy for coronary stent applications**

### **Abstract**

The demand for micromachining of coronary stents by means of industrial lasers rises quickly for treating coronary artery diseases, which cause more than one million deaths each year. The most widely used types of laser for stent manufacturing are Nd:YAG laser systems with a wavelength of 1064 nm with pulse lengths of  $10^{-3}$ - $10^{-2}$  seconds. Considerable post-processing is required to remove heat-affected zones (HAZ), and to improve surface finishes and geometry. Using a third harmonic laser radiation of picosecond laser ( $6 \times 10^{-12}$  s pulse duration) in UV range, the capability of the picosecond laser micromachining of nitinol and platinum-iridium alloy for coronary stent applications are presented. In this study cross-free cut of nitinol and platinum-iridium alloy tubes are demonstrated and topography analysis of the cut surface is carried out. The HAZ characteristics have been investigated by means of microscopic examinations and measurement of micro-hardness distribution near the cut zones.

**Keywords;** 1064 nm; Coronary artery disease; Coronary stents; Microhardness distribution; Nd : YAG lasers; Picosecond laser; Platinum-iridium alloys; Post processing; Pulse durations; Pulse length; Surface finishes; Third harmonic