

Medical Catheter Wire Stripping – Polyimide / Enamel Wires

Introduction

The latest advances in electrophysiology require packing ever more sensors and wires into ever smaller packages. Polyimide (also called enamel) type insulations offer the highest density of interconnects due to the thin, tough insulation. Wire gages of 42 AWG to 50 AWG are now commonplace, with applications for wires smaller than 50 AWG now appearing. These wires are tough to strip. There are only 2 real options: mechanically scraping or hot caustic dipping. The former presents a challenge for small gages due to damage of the conductor and the latter is not preferred due to safety issues and residues. Even standard laser stripping with carbon dioxide lasers is not a solution as the long wavelength of the light means that a microscopic residue is left which cannot be soldered to.



Figure 1: Boston Scientific mapping catheter

Solution

Our Odyssey UV laser technology offers a gentle yet powerful method for the removal of polyimide type insulations. The short wavelength of the ultra-violet light coupled with nanosecond duration pulses enables the enamel to be instantly vaporized. By tuning the energy of the laser pulses, it is possible to completely remove the enamel whilst leaving a clean metallic surface for soldering. The process is gentle enough to leave thin plating layers such as gold, silver or tin without removing them.

Unlike older gas-based excimer technology which is very expensive to purchase and run, the Odyssey systems utilize modern solid-state laser technology which has no dangerous consumable gases. Also utilizing “direct write” technology means that strip patterns can be directly programmed via the user interface and there is no need for cumbersome masking and imaging of the laser beam.

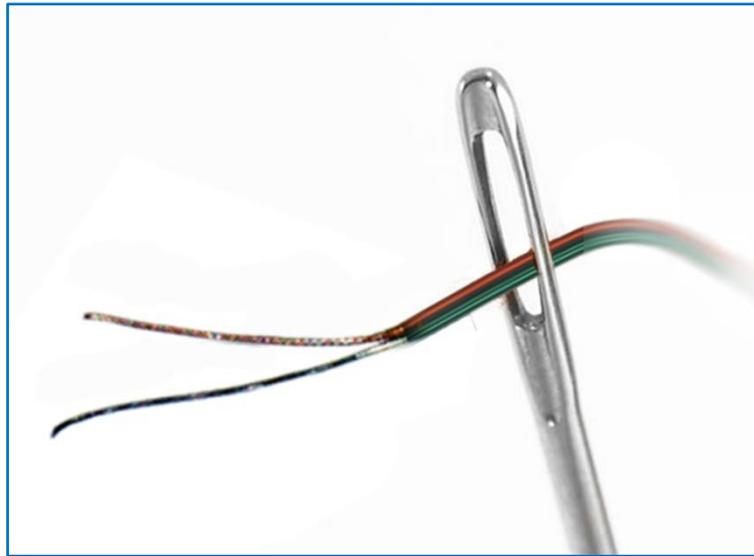


Figure 2: Catheter thermocouple laser stripped with Odyssey technology

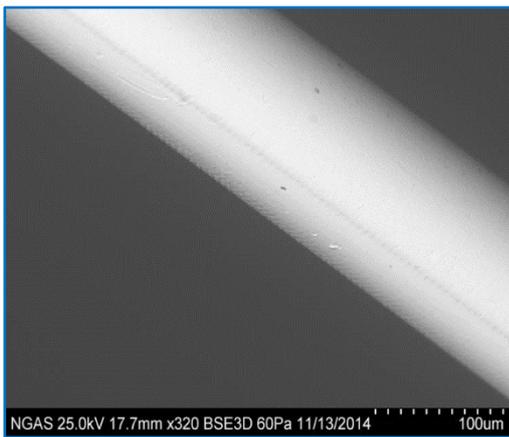
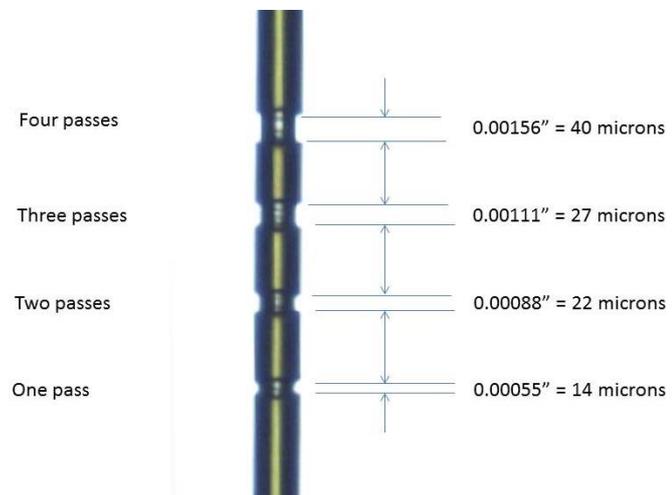


Figure 3: Electro- micrograph of the stripped wire surface

Pre-cut wires, such as those protruding from the catheter handle, can be stripped directly using an Odyssey-2 stripping system. The new, compact Odyssey-4 coming in 2017 is an advanced version. Wires can also be automatically stripped directly from a spool and then either re-spooled or cut to length. The customizable Odyssey-3 system can be offered for this purpose, or LWS can perform this process for you in its ISO9001 accredited production facility.

Figure 4: High levels of control can be achieved with the Odyssey laser technology directly from the user interface

By controlling the laser pulse energy, it is also possible to laser cut these fine wires with the same laser source – meaning a convenient and accurate method for controlling strip length.



The same laser technology can be used to cleanly cut a wire.



Figure 5: Laser cut medical coil



Figure 6: Laser stripped

A number of specialist wire manufacturers are able to create multi-filar ribbon cables which can be highly convenient in a device design if it is possible to strip windows in the ribbon cable for direct bonding to flex cables or PCBs. This is something that can only be achieved with advanced laser stripping technology. To make an ideal connection it is necessary to selectively strip one wire without impinging on adjacent wires. Moreover, it is often convenient to laser cut the wires to further aid the soldering process.



Figure 7: 42 AWG quad-filar catheter cable selectively laser stripped and cut

