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www.cleantools.de

CleanTools

Crevice-free, high reliability, bi-metallic, surgical Instruments manufactured from shape memory alloys

The research leading to these results has received funding from the European Community´s Seventh framework Programme FP7 2007-2013 under grant agreement 286888

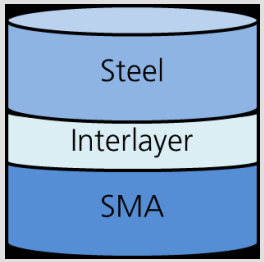
PROJECT

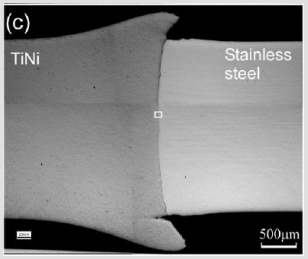
The goal of the CleanTools project is the development of joining techniques for novel surgical instruments, in order to incorporate an appropriate flexibility to the instruments.

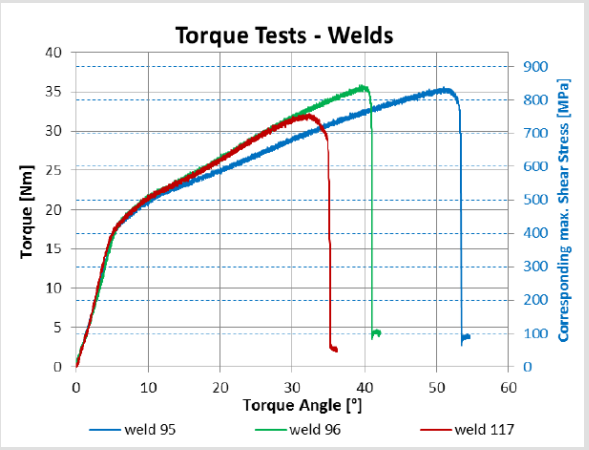
Flexible medical instruments such as bone reamers are currently constructed from a combination of materials with very different properties. This seems to be required to design functional instruments with tailored properties. The state of the art concept for constructing such flexible medical instruments bases on the mechanical coupling of different parts. However, the effective and successful decontamination of such instruments is difficult and a high risk for cross infections remains.

The joining of flexible materials like shape memory alloys with biocompatible materials with less flexibility by welding has the potential to eliminate the sterilization problems. The key idea in the project is to develop a powerful rotary friction welding process for connecting shape memory alloys with stainless steels.

TECHNOLOGY







SOLUTION

Many combinations of dissimilar materials can be directly friction welded without creating problematic intermetallics. The direct welding of titanium to steels however has been found to be more challenging, due to the formation of a brittle intermetallic layer at the joint line. In such circumstances it is usually preferable to make these joints by including a third material as an interlayer. The interlayer material used is normally compatible with both materials, and ends up being present in the final component as a thin layer between the two parts. In many cases, due to local constraint of the interlayer, high tensile strength results can be achieved, but it is usually not possible to replicate full parent material mechanical properties across the overall joint.

Given the constraint of only being able to use biocompatible metals as interlayers, this project was challenging from the start. Welds developed on the project have demonstrated that good weld properties, measured under tension, torque and fatigue testing can be obtained, that exceed the initial expectation.