by Rick Schultz

Understanding Instrument Metal Terminology

FOR HUNDREDS OF YEARS, stainless steel has been used to manufacture the world's finest quality surgical instruments. This manufacturing process demands time-consuming, hands-on labor from highly-skilled craftsmen. Just as there are many types of surgical instruments, there are two primary types of stainless steel used for producing these instruments: 300 series and 400 series.

Instruments produced using 400 series stainless steel include scissors, osteotomes, chisels, rongeurs, forceps, hemostats and needle holders. This hardened steel falls into the martensitic category.

Martensitic describes stainless steel that can be heat hardened. It is subject to corrosion due to lack of nickel. This type of stainless steel is stronger, but brittle.

Properties of 400 series stainless steel categorized as a martensitic stainless steel:

- Able to be heat hardened;
- Subject to corrosion due to lack of nickel;
- High strength, high wear resistance;
- Examples include scissors, osteotomes, chisels, rongeurs, forceps, hemostats and needle holders.

Instruments produced using 300 series stainless steel include ribbon retractors, probes and suction tubes. This series offers high corrosion resistance, but does not offer the hardness properties of 400 series stainless steel, thereby, making the steel more workable and malleable. This malleable steel falls into the austenitic category.

Austenitic describes stainless steel that cannot be heat hardened. It is highly corrosion-resistant, non-magnetic and contains high amounts of chromium and nickel.

Properties of 300 series stainless steel categorized as an austenitic stainless steel:

- Unable to be heat hardened;
- Highly corrosion resistant;
- Easier to weld;
- Bendable/malleable;
- Generally used for non-cutting instruments;
- 316 LVM is used for surgical implants; a high level of purity is required for these implants;
- Examples include malleable retractors, probes and suction tubes;

In summary, every hospital in the world has both 300 and 400 series stainless steel in their instrument inventory.

There are additional metals used to manufacture surgical instruments in order to make them malleable, lighter weight or more durable. These metals include:

Sterling silver - A soft, malleable metal used to manufacture probes, lacrymal probes, uterine sounds and tracheostomy tubes.

Titanium – A very strong, lightweight metal most commonly used to manufacture microsurgical instruments. This metal is identified by its blue color and is ideal for use in MRI procedures because it is not magnetic.

Aluminum – A lightweight metal used to manufacture certain pediatric/adult rib spreaders and some sternal retractors.

*Note: Sterling silver, titanium, and aluminum instruments should **not** be ultrasonically cleaned with each other or with stainless steel instruments. These are dissimilar metals and ultrasonically cleaning them together may result in cross plating.*

Tungsten Carbide | Diamond Dust | Phenolic

For accurate ordering and inspection, it is necessary to understand certain additional features available on some surgical instrument patterns.

Tungsten Carbide – An extremely hard metal used in the jaws of needle holders, forceps and pin cutters, blades of scissors and bone files. When tungsten carbide is present in the working portion, the handle of the instrument is gold in color.

Diamond Dust – A coating used in the jaws of needle holders and forceps that are used to hold fine needles in delicate surgeries such as cardiovascular procedures. No diamonds are present. The jaws have a micro carbide dust which helps the surgeon grip very fine needles. Many times, the rings of diamond dust needle holders are blue, similar to the markings of titanium.

Phenolic – A composite resin material used in the handles of certain osteotomes and hand retractors and special orthopedic devices.

PROTECTIVE QUALITIES OF PASSIVATION

The process of passivation is equally important to the durability and life expectancy of surgical instruments. Passivation is the selective removal of iron from stainless steel surfaces using a nitric acid bath. This enhances the chromium content of the surface, forming a protective layer that help prevents corrosion of the stainless steel. Passivation is done during the final stages of manufacturing. Instruments that are not passivated or properly passivated, such as most Pakistan instruments, are likely to stain and corrode relatively quickly.

It is important to remember that the passivation layer will always "heal" itself after the instrument refurbishing process. This is because the layer is formed spontaneously when exposed to air/oxygen and moisture. C

Q I currently have a surgeon who is requesting a specific malleable instrument. The manufacturer states that it is 300 series stainless steel. Our facility is only permitted to use 400 series stainless steel. Can you help us?

A Instruments that require the ability to be malleable are made of 300 series stainless steel. Four hundred (400) series stainless steel is used for scissors, needle holders and osteotomes, for example. 316 LVM series stainless steel is commonly used for implants. For this reason, all hospitals have and need both 300 and 400 series stainless steel instruments.

RICK SCHULTZ, the Instrument Whisperer™, is an author, inventor and lecturer, and the retired Chief Executive Officer of Spectrum Surgical Instruments Corp. He served as contributing editor of IAHCSMM's Central Service Technical Manual (Fifth, Sixth, Seventh, Eighth Editions) and authored the textbook, *Inspecting Surgical Instruments: An Illustrated Guide*. Schultz was named IAHCSMM's Educator of the Year in 2002, and in 2006, was named American Hospital Association Educator of the Year. In 2007, he was named by Healthcare Purchasing News as one of the 30 Most Influential People in Healthcare Sterile Processing. Schultz currently provides educational lectures to Central Service professionals at IAHCSMM's annual conferences and conducts operating room personnel lectures across the country.