MetalTek INTERNATIONAL
BECAUSE YOU DEMAND MORE THAN METAL

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Tek Bulletin

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Metals Trivia:

- Corrosion costs the US economy more than $276 Billion per year (3% of GDP). And...20-30% of the costs are preventable. [from NACE / US Highway Administration Report 2002]
- Tungsten melts at approximately 3400°C and boils at over 5500°C. No wonder it works so well as light filaments.

The investment casting process is one of the oldest casting processes (only being pre-dated by sand casting). Ancient artists produced sculptures of great complexity using the "lost wax" method.

Today, that technology is used primarily due to its accuracy and ability to produce highly reactive materials (those that have elements that react readily with air). Investment castings today can range from a few grams to several hundred pounds. Not bad for something that started as "art."

Have a Metals problem?
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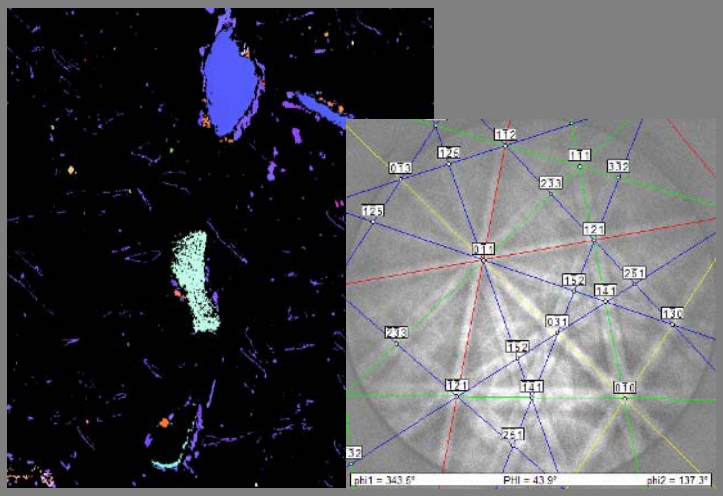
MICROSTRUCTURES

Many of us enjoy shows dealing with forensic examination. It may be the combination of logic and cutting-edge science that attracts many with engineering backgrounds to such shows as CSI, Bones, etc.
Metals may be similarly examined and much of their history is buried in their structure, if we know what to look for.
The examination of metallic materials after proper preparation is often performed using a special metallurgical microscope called a metallograph. Metallurgical engineers can use this examination to determine many things such as material condition, grain size, phase composition, phase distribution, etc.
Examination of metal surfaces is usually accomplished using low magnification examination or with the aid of scanning electron microscopy (SEM). The SEM can show 3-dimensional images of the component being examined with magnifications from 2 to over 100,000X, as necessary. This examination can reveal unusual wear patterns, deleterious phases, brittle-type fracture, external damage, etc. and is invaluable in assessing cause of failures.
In addition to the optical images provided by SEM microscopy, most units can also perform chemical analysis using energy dispersive x-ray (EDAX) or wave length dispersive x-ray (WDS) techniques for bulk analyses or to determine the composition of various micro-constituents. Further characterization of micro-constituents is possible using more complex analytical tools such as electron backscatter diffraction (EBSD), AUGER and scanning transmission microscopy (STM).



SBSD Map and Diffraction Pattern for NbC in 25Cr-35Ni-1Nb Alloy

ALUMINUM BRONZE AND AQUEOUS CORROSION

Aluminum bronzes, especially those containing nickel, offer excellent resistance to aqueous corrosion, while also offering cost-conscious material options to designers.
In aqueous environments without chlorides, aluminum bronze can rival 304-type (cast CF8) stainless steels for general corrosion and strength. The addition of nickel to the aluminum bronze alloy increases its resistance in chloride containing environments and also increases yield strength by over 28%.
Corrosion resistance of the aluminum bronze alloys is due to the formation of a protective aluminum oxide surface film, much like chromium oxide imparts corrosion resistance to stainless steels with a chromium rich layer.
Manufacturing of aluminum bronze alloys is straightforward and the alloys are readily weldable. Chemistry balance and phase distribution is critical to maximizing corrosion resistance, especially in brackish seawater.
While both aluminum bronze and nickel aluminum bronze can be used as-cast or in an annealed condition, annealing is recommended for severe service applications.