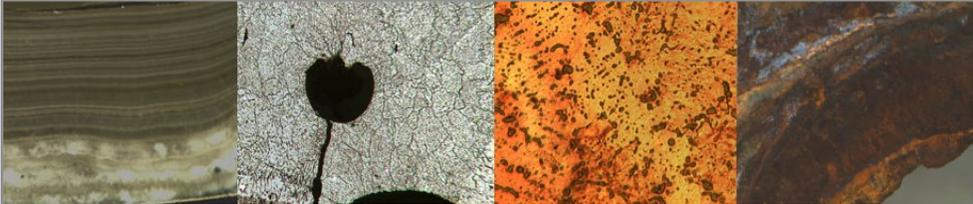


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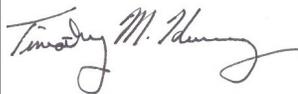
ELEMENTAL ANALYSIS OF METALL ALLOYS

DECEMBER 2014 SUPPLEMENT

Welcome to New Hampshire Materials Laboratory

From the aerospace industry to a metal alloy manufacturer and everything in between, elemental analysis of materials are a necessary part of the buying, selling and manufacturing process. In this Nuts & Bolts Supplement, we will discuss the ICP and GDS elemental analysis techniques and some key benefits. We will also walk you through the actual process of how both methods of analysis are performed within our lab.

For more information or to find out more on how we can be “Your Problem Solving Partner”, please visit our website at www.nhml.com or call our toll free number 800-334-5432.



Tim Kenney
Laboratory Director



Everyone here at NHML, would like to also wish each and everyone of you a very happy holiday season.

To Be Continued on Page 2 

New Hampshire Materials Lab
www.nhml.com • lab@nhml.com • info@nhml.com
Tel: 800-334-5432 or 603-692-4110 • Fax: 603-692-4008

Elemental Analysis of Metal Alloys

Analyzing and finding the chemical composition of metal alloys can be very important and valuable to a variety of industries. Here at NHML we are capable of finding the “recipe” of elements that comprise a particular metal sample when provided by our customers. We do this with 1 of 2 methods: ICP Spectroscopy or Glow Discharge Spectroscopy (GDS). These types of analytical chemistry are used to separate, identify and quantify the elemental components of materials. Both techniques are closely related as they both are EMISSION Spectroscopy, but differ in how a sample is introduced into the system. Each method is capable of about the same degree of accuracy; however, the technique to be used is much determined by the geometry of the sample provided.

Through the GDS analysis, the elemental concentrations of the solid materials are measured by using Argon gas ions. These ions mill material from the sample surface which is then excited in a plasma discharge. The resulting light emission is then used to quantify the composition of the sample. As long as the sample has a flat surface and is at least ½ inches across, we are able to analyze through GDS. GDS also has the capability of determining carbon and sulfur content while ICP requires a separate analysis using combustion. Infrared methods are required if the sample cannot be analyzed by GDS. However, if the sample does not have this geometry, for example a small ball bearing, then it must be analyzed by ICP Spectroscopy. In order to run a sample by ICP, the material requires cutting or drilling a small amount (approximately 0.15 grams) for the test. ICP samples are then acid digested, diluted in water and aspirated into a plasma torch. This produces excited atoms and ions that emit electromagnetic radiation at wavelengths. The concentration of the emission is indicative of the



BRONZE WAS ONE OF
THE FIRST ALLOYS
CREATED BY HUMANS.



Examples of various metal alloys

The concentration of the emission is indicative of the concentration of the elements within the sample. An advantage of ICP over GDS is that we are able to customize our ICP methods to suit the needs of particular analysis. Whereas the methods used in GDS are “boxed” and cannot be modified by the operator. By using either of these two methods, we are able to give our customers an elemental analysis of their sample in question along with having the chemist who performed the testing readily available to speak with them in case any question may occur.

There are many reasons as to why these particular test methods are useful. One very good reason is because nearly every metal alloy must be

To Be Continued on Page 3



Carefully chosen for its given application because its elemental composition gives rise to physical and engineering properties that may be necessary for that application. For example, the stainless steel chosen for a particular application must meet the “chemistry requirements” of 316 stainless steel because only that particular recipe of elements produce the engineering properties needed for that specific application. We also believe that with the introduction of the ISO 9000 system, companies that are held to this quality program are required to send out a representative sample of their incoming material every so often to be analyzed even if they already have a material certification as an additional quality control check. This additional requirement sometimes catches metal which may have been purchased from an overseas vendor, but when carefully analyzed, does not meet to certain chemical specifications to which they are supposed to conform to.

Depending on which chemical technique is used, the usual turnaround time for this testing is roughly 2-3 days from the time a sample is arrived. For costs and any other questions that you may have about this subject, please feel free to give us a call on our toll free number 800-334-5432 or email at info@nhml.com.

Here are a few more examples of metal alloys.

