

Aluminum WrapUp

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Providing Aluminum Answers™
for the Industry

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Secat News

New Client



Secat, Inc. is pleased to announce an agreement for testing services with Golden Aluminum, a casting and rolling mill, located near Denver, Colorado. The agreement between the two companies is to provide R&D, technical support and other services to Golden's operations.

Golden Aluminum supplies aluminum rolled sheet products to the beverage & food packaging, automotive, building materials and consumer goods industries. Golden Aluminum is a leading innovator of aluminum sheet continuous-cast technology and

a developer of sustainable very high recycled content alloys to improve the aluminum process value stream.

Secat, Inc. is world renowned in aluminum testing, research, failure analysis, product development, alloy development, and the enhancement of processes and properties. Secat is located in Lexington KY.

Find Golden Aluminum at www.goldenaluminum.com

Coming Soon!

Watch for online registration information for the November 5, 2015 event!

Secat, Inc. will be offering its first-ever introductory course on aluminum. Targeted to a wide variety of audiences, Aluminum: Wrapped UP will introduce students to aluminum, its characteristics, alloys, processes, forms, and applications. Students will leave with a broad understanding of the manufacturing process – from bauxite mining to primary and secondary production to recycling. Along the way, students will also learn about the various alloys, tempers and designations of aluminum and the commercial factors that influence buying behavior.

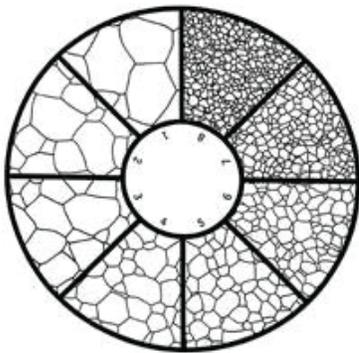
www.secat.net

Featured Capabilities

Grain Size Analysis

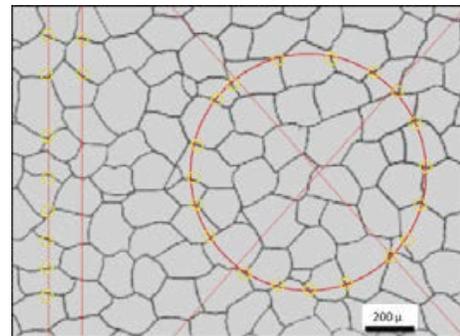
Metals are crystalline and contain internal boundaries which are the grain boundaries. Grain size has a significant effect on the properties of metals and alloys. Processing of materials can lead to creation and modification of grains. Therefore, grain size measurement is an important feature of Metallography for quality control. Secat uses grain size analysis for billet homogenization evaluation, heat treatment evaluation, rolling sheet evaluation and other applications. A wide variety of international standards are available as guidelines for grain size measurement out of which ASTM E112 is the most used in North America. E112 provides various test methods for the evaluation of grain size of single phase grain structures which can also be used to determine the average size of a particular type of grain in multiphase structure.

The quickest and fairly accurate method is the [comparison method](#). Comparison method can only be used for completely recrystallized materials with equi-axed grains. The estimation of grain size by this method is made by direct comparison at same magnification. In this method, the live image of grains is observed under the microscope with the presence of eyepiece grain counting reticle. Direct comparison can be made in the microscope to the closest matching ASTM grain size number (G number). ASTM E112 presents different types of comparison charts (Plates I through IV) which can be used for various grain types (twinned and untwinned) and sizes (ASTM G numbers 1 to 8).



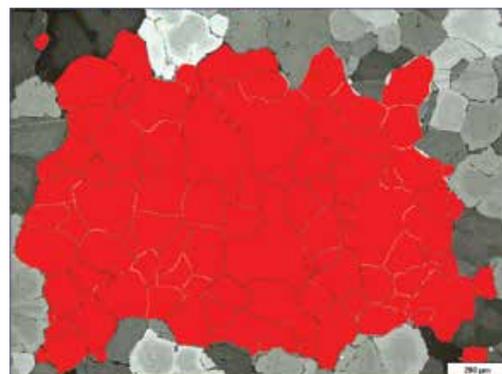
Comparison Method (Eye piece reticle - www.olympus.com)

Another method which is more accurate is the [intercept method](#). A pattern of lines (0°, 45° and 90°) or circles is superimposed on a captured digital or photomicrograph at a known magnification. The total number of intersections of the test lines with the grain boundaries are counted manually or using an image analysis software. ASTM G number is then calculated using the number of intersections and pattern length.



Intercept Method

The most accurate method is the [planimetric method](#), which yields the number of grains per unit area. In this method, a rectangle or circle is inscribed on a captured digital or photomicrograph at a known magnification. The total number of grains within the field are counted. The ASTM G number can then be estimated using number of grains per unit area.



Planimetric Method

Many metallurgical-specific microscope image-analysis software packages like Omnimet Image analysis by Buehler calculate the grain size using the planimetric method. These software programs can perform automatic reconstruction of grain boundaries, analyze individual grains, determine the area fractions, actual grain size, ASTM G number and histograms of grain size distributions and generate reports.

Walter J. (Wally) Palen
Assistant General Manager, Toyota Motor Manufacturing, Kentucky, Inc.



In January 2012, Wally Palen joined the executive team at TMMK responsible for the body operations department. As such, he leads Toyota's largest stamping facility in North America, while also championing cross functional stamping initiatives for Toyota's North American manufacturing operations. Palen is one of the few corporate executives to be tapped to join Toyota's Kentucky plant, which manufactures the Camry, America's best-selling car, and was recently named the new home of the first U.S.-produced Lexus. Palen's career with Toyota began in 1997 as a specialist in the logistics department. He has since served in multiple leadership roles within Toyota's network of manufacturing operations across the United States, including chief production engineer of the North American Camry and prior to that from 2005-2007, program manager of adding production capacity at Subaru Indiana Automotive which produces Toyota Camry. From 2003 to 2006, Palen served as Manager, Supply Chain Strategy at Toyota Engineering and Manufacturing NA, after having been promoted multiple times following his career start nearly a decade earlier. Palen recently was named the Executive Advisor of TMMK's newest business partnering group Spectrum, which supports TMMK's GLBT demographic. Wally's passion and energy has been a driving force

in the recent resurgence of class leading safety and quality in the Stamping area. Palen's focus on making good people great and doing whatever is needed to provide the proper tools, training and environment is no doubt making TMMK a better place. A native of Warren, Ohio, Palen received his Bachelors of Science degree in Business Administration from The Ohio State University in 1996. He and his wife, Kristine, reside in Northern Kentucky with their three children Abigail, Jack and Anna.

What brought you to the Board of Directors of Secat?

Toyota is entering a new chapter in regards to developing our next generation platform for all of our mid size sedans and SUV's. One of our main challenges is meeting the new CAFÉ fuel economy standards. To meet the very severe new regulations, a variety of new technologies are being adopted to reduce vehicle mass. One main pillar of our mass reduction strategy is adopting aluminum. Secat has the opportunity to help companies like Toyota and its suppliers overcome the knowledge gap introducing aluminum into our manufacturing process. I see my role to foster and develop Secat's relationships within the OEM world beyond the current business stream.

In your opinion, what makes Secat unique/special in the industry?

Secat has a unique niche that brings superior industry knowledge to its clients with the unparalleled resources of the University of Kentucky that can be drawn on to tackle difficult problems. The diversified client base also provides much needed technical capabilities needed to tackle difficult problems. Odds are Secat has encountered the exact same issues with a previous client or a close variation. This limits long lead time and high costs usually associated with complex problems.

What is the most important/exciting development you see in the future for Secat?

Without a doubt it is the burgeoning adoption of aluminum being used in vehicle manufacturing in Kentucky and the surrounding states. Secat has a unique opportunity to diversify its business to include OEM business with companies like Toyota and its massive supply base. The new Ford F-150 has adopted aluminum across the board to improve fuel economy. Toyota and other OEM's are following suit. Secat has the capability to extend its reach beyond the traditional raw material related to supply base by partnering with companies adopting aluminum into their processes and help prevent the pitfalls of aluminum processing like stamping, welding and painting.

Tell us something about yourself that people may not know. . . and anything else you would like to share.

When I started working for Toyota almost 20 years ago, I would have never thought I would find myself working at such a prestigious facility like TMMK. I spent the first 14 years of my career in logistics, project management and production engineering. When I was considering taking a job in manufacturing, honestly I was very nervous just thinking about how difficult it would be compared to my previous roles. After a lot of words of encouragement from Wil James and others, I decided to take the leap. It has now been over 4 years since I joined TMMK. It has been the hardest job I have ever had but also the most rewarding.



Aluminum Tech Talk

Creating Advantages with ECAP

Equal Channel Angular Pressing (ECAP) is one of the severe plastic deformation (SPD) methods to achieve ultra-fine-grain (UFG) structure in metallic materials. Fig 1 shows the schematic of ECAP, which is to take a bulk coarse-grain alloy to produce a UFG structure (grain size < 1µm) through heavy straining when passing through the angular channel. Compared to other SPD methods, ECAP holds several advantages such as simple procedure and equipment, it can be applied to a wide selection of metals and alloys, the ability to scale up for large samples, and attaining reasonable homogeneity. It has been

demonstrated that based on die and processing design, ECAP can be applied to rod, bar, and sheet products. The benefits achieved by ECAP include UFG micro-structure, high strength, super-plasticity, high fatigue life, and good high temperature performances. Fig 2 shows an example of the improved mechanical properties of the ECAP process for Al-Ag alloys, compared to solution heat treatment and cold rolling. ECAP is a feasible method for developing high end products which will be suitable for special applications.

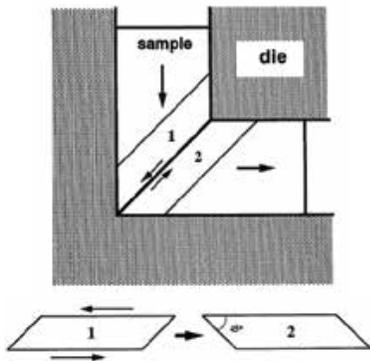


Fig 1 Schematics of ECAP. Elements numbered 1 and 2 are transposed by shear as indicated in Fig 2⁽¹⁾

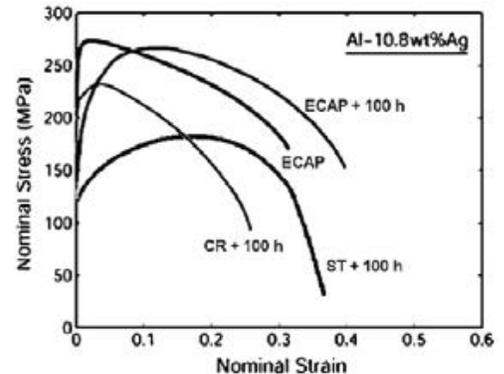
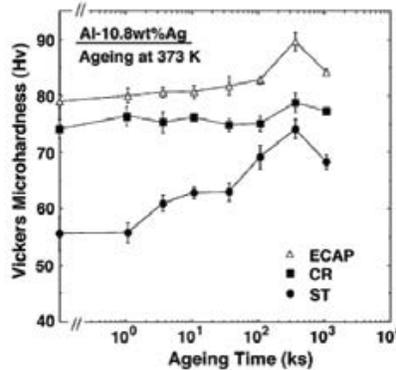


Fig 2 A demonstration improved mechanical properties of Al-10.8%Ag alloy after ECAP comparing to solution treatment (ST), cold-rolling (CR) and ECAP⁽²⁾

1, Nakashima K, Horita Z, Nemoto M, Langdon TG. Mater Sci Eng 2000; A281-82.
2, Horita Z, Ohashi K, Fujita T, Kaneko K, Langdon TG. Adv Mater 2005; 17:1599.

Aluminum Art



Casting Art from Anthills

An anonymous American artist makes casts of ant colonies using molten aluminum. So far, he has made casts of fire ant (solenopsis genus), carpenter ant (camponotus genus), winter ant (prenolepis imparis), Aphaenogaster treatae, and fungus farming ant (Trachymyrmex septentrionalis) colonies. Some find the work controversial, but many find the end product amazing and beautiful. The variation in colony structure among different ant species is very interesting. Be sure to check out the website at www.anthillart.com to see more pictures and information on the casts. Also, check out some videos of the casting process on YouTube at <http://www.youtube.com/anthillart>

