Aluminum WrapUp

VOLUME 2 + ISSUE 4 NOVEMBER 2014

Providing Aluminum Answers™ for the Industry

SECAT
PROVIDING ALUMINUM ANSWERS™

Secat News

Secat Announces New Client

SECAT, INC. is pleased to announce an agreement for testing services with Skana Aluminum Company located in Manitowoc, Wisconsin. The agreement between the two companies is to provide R&D, technical support and other services to Skana's casting and rolling operations.

SKANA ALUMINUM

Skana Aluminum is a fully integrated rolling mill, complete with direct chill (DC) casting, hot and cold rolling, slitting, tension leveling and finished coil, sheet or circle capabilities. Skana is very efficient at casting small quantities of specialized alloys and higher volumes of more common alloys.

Find Skana Aluminum at www.skanaaluminum.com.

www.secat.net

Testimonial

Aluminum foil is widely used in packaging including the manufacture of beverage pouches, pharmaceutical blisters packs, tubes that provide a barrier against external factors such as heat, moisture, bacteria and odors, etc. Aluminum pouches are usually made from a multi-layer composite of which the infinitely recyclable aluminum foil is the essential barrier layer.

A customer had issues with respect to proper adherence of the backing material to the aluminum after application of the adhesive. Samples were sent to Secat for evaluation. The evaluation determined that surface contamination was present on the foil/backing material which prevented adhesion of the backing material to the aluminum. The nature of the contaminants was identified and discussions were carried out with the customer to determine the probable source of the contaminants.

Based on the analysis, the customer was able to determine the source of the contaminants and implemented corrective action within their processes to eliminate the source. This resulted in a reduction in the number of rejections from poor adhesion to less than 1%.

Evaluation of Grain Refiners for Aluminum Alloys

Grain refiners are a key additive for the production of aluminum (Al) alloys influencing properties such as strength, elongation, formability, and corrosion. There are multiple grain refiners available, from various mixes of Al with Ti and B to mixes of Al with Ti and C. The effectiveness of a grain refiner is based on the size and distribution of inoculating phases present, such as $TiAl_3$ and TiB_2 in Al-5Ti-1B, which influences nucleation of the primary Al phase during solidification.

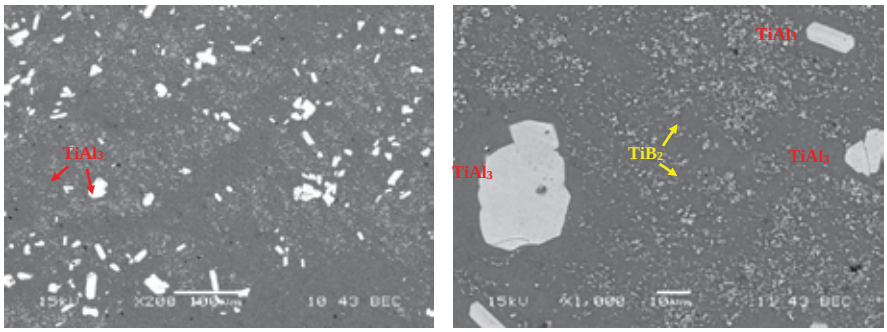
Generally, the larger $TiAl_3$ and the very fine TiB_2 (< 1 µm) constituent phases are expected to be uniformly distributed in the grain refiner; however, they may also be randomly distributed or form agglomerated patches throughout the grain refiner. Evaluation of the characteristics of the particles of $TiAl_3$ and TiB_2 is extremely important to determine a vendor's suitability to effectively grain refine without introduction of inclusion issues or filter clogging effects.

The combination of the JEOL 5900LV Scanning Electron Microscope (SEM) and the Omnimet Image Analysis System at Secat can be used to characterize the size, dispersion, and fraction of the $TiAl_3$ and TiB_2 phases for a given grain refiner. Given below are examples of particle analysis of inoculating phases in a grain refiner for Al alloys.

Figure 1 shows the SEM images of the intermetallic particles $TiAl_3$ and TiB_2 at different magnifications. Two types of particles are observed – large polygon shape particles (~10-50 µm) and finely dispersed particles (~0.1-2 µm). These two types of particles were randomly distributed within the matrix.

Figure 2 shows the original SEM images and the processed images using the Omnimet system at Secat. The particles are highlighted in red and yellow for use in the particle analysis.

Fig 1: SEM/BEC image of the intermetallic particles the AlTiB alloy at 200× and 1000×

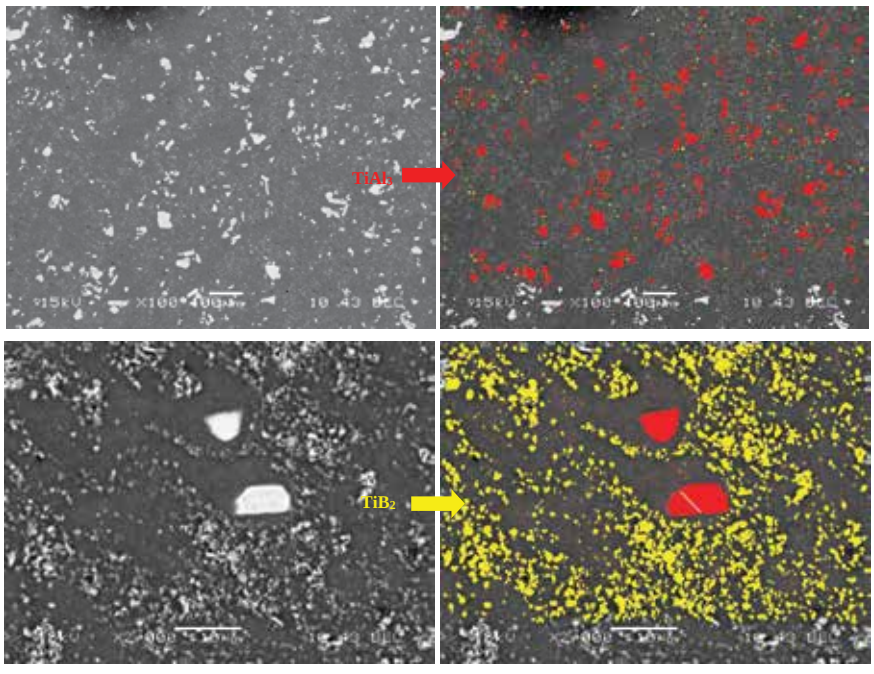


(a) SEM/BEC, 200× (a) SEM/BEC, 1000×

Tables 1 and 2 provide a portion of the characterizing parameters available for the particles including density (number/mm²), diameter and morphology.

Based on the evaluations, grain refiners can be compared and correlated to casting performance; helping both grain refiner manufacturers improve their products and the cast shops in sorting and ranking suppliers.

Fig 2: Representative SEM images before and after processing by Omnimet for phase analysis -- Upper row (100X) - $TiAl_3$; Lower row (2000X) - TiB_2



Phase Analysis Results		$TiAl_3$
Particle Area % in 1.0334mm²		5.26
# Particles per 1mm²		281
Aspect Ratio	Max	4.35
	Average	1.95
	Min	1.16
Particle Diameter (µm)	Max	36.41
	Average	13.54
	Min	5.42
Particle Length (µm)	Max	84.71
	Average	20.90
	Min	9.80
Particle Width (µm)	Max	42.35
	Average	11.50
	Min	3.92

Table 1 –Particle phase analysis data - $TiAl_3$

Phase Analysis Results		TiB_2
Particle Area % in 2635.04µm²		19.98
#Particles per 1 µm²		0.44
Aspect Ratio	Max	4.00
	Average	1.57
	Min	1.07
Particle Diameter (µm)	Max	2.38
	Average	0.67
	Min	0.19
Particle Length (µm)	Max	3.81
	Average	0.95
	Min	0.30
Particle Width (µm)	Max	2.37
	Average	0.62
	Min	0.10

Table 2 –Particle phase analysis data – TiB_2

Secat Person of Interest

George Ward
Executive Director, Coldstream Research Campus & President of Kentucky Technology, Inc.

George Ward is the Executive Director of the University of Kentucky's Coldstream Research Campus where he handles real estate development and leasing for Coldstream and the high tech business incubator on UK's main campus. He has over 30 years executive experience in hotel and real estate development, finance and business operations, economic development, and government relations. George stays in close contact with cutting edge new technology being developed by start-up companies with ties to UK. His network and experience enables him to match entrepreneurs with researchers at the University of Kentucky, appropriate mentors, and local angel investors.

Following graduation from Cornell University's School of Hotel Administration, in 1979, George worked 7 years in various hotel management positions with Cincinnati based Winegardner and Hammons, Inc. He then served 18 years as president of H&W Management Co. Inc., a Lexington based hotel development and management company that he co-founded. In 2004, he was appointed Commissioner of Kentucky State Parks and later served as Secretary of Kentucky's Commerce Cabinet until December 2007.

George grew up in East Syracuse, NY and has lived in Lexington since 1984. He and his wife Lorie raised six children.

What brought you to the Board of Directors of Secat?

I serve two roles for the University of Kentucky, Executive Director of the Coldstream Research Campus where Secat is located and President of Kentucky Technology, Inc. (KTI) the sole common stockholder of Secat. I serve as the KTI representative on the Secat board.

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

During my time attending board meetings, I have observed the willingness of the aluminum industry board members to provide guidance to keep Secat on the cutting edge of the industry. The companies these board members represent benefit because the board is interested in lifting the entire aluminum industry.

Research campuses connect private industry with researchers and student talent and Secat is a great example. Secat has a close connection to metallurgical researchers at the University of Kentucky and its own top researchers specializing in the aluminum industry. The combination of these talented researchers and Secat's state of the art testing equipment enables Secat to perform a variety of services for aluminum companies of all sizes including those that do not have their own research and development departments.

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

As the automotive and aerospace industries start moving to lighter materials, aluminum will play a major role. With its Lexington, KY location, Secat is geographically well positioned to take advantage of this trend. Many people do not know that Kentucky's largest export industry is aerospace. As for vehicles, Kentucky ranks third in the nation in car production and second in light trucks.

A Toyota engineer was recently added to the Secat board and I am very excited to see where this new knowledge brings Secat in the future.

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

I spent most of my career in the hotel industry; including 18 years as the President of a company I co-founded in 1985. The company, HW Hotels, will celebrate its 30th anniversary next year. In the spring of the last four years, I have been able to use this experience and pass it on to the next generation of hoteliers by teaching a 400-level class at UK titled Strategic Management in the Hospitality and Food Service Industry. In January 2015, I will be introducing a new class, Entrepreneurship in the Hospitality Industry.

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Featured Capabilities

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Failure Analysis

Failure analysis is a useful tool in determining the probable cause of failure of cans/can lids during their manufacture, filling operations, or final storage and use.

The analysis helps to determine the most probable root cause of failure and whether corrective actions are to be taken at the sheet manufacturer, can maker or at the filling station/storage.

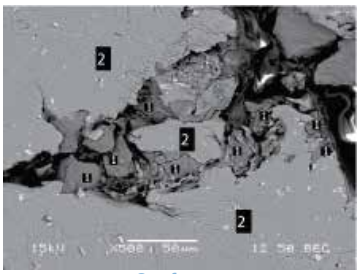
The history of the sample is the main factor that assists in determining the probable cause of the defect. The history would include a detailed timeline with process parameters at each stage of the production process.

Failure analysis of a can defect (seen as a pinhole) is described below.

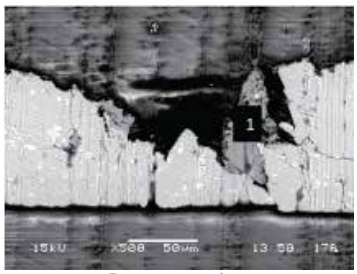
Low magnification examination of the defect helps to determine the probable starting point and would normally enable determination of the most probable cause of the defect and type of analysis which would be most helpful in confirming the preliminary analysis. This would be followed by Scanning Electron Microscopy (SEM) at the site to identify whether the defect occurred during rolling of the sheet, can making stage (i.e. ironing), or due to foreign matter introduced during sheet/can making. A cross section analysis would then be performed if it is difficult to determine whether the defect is only at the surface or within the sheet.

Energy Dispersive Spectroscopy (EDS) analysis is a useful tool to determine whether there is foreign matter at the site which could have caused the defect. The foreign matter could have been introduced during the casting stage – Fig 1 (inclusions such as oxides, etc), rolling stage – Fig 2 (roll steel, aluminum chips, rolled in scratches/slivers, etc.) or at the can making stage - Fig 2 (tooling damage, aluminum chips).

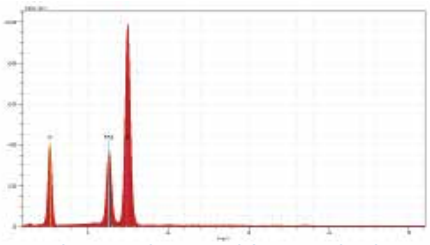
This, combined with the orientation, will help to finalize the nature and source of the defect.



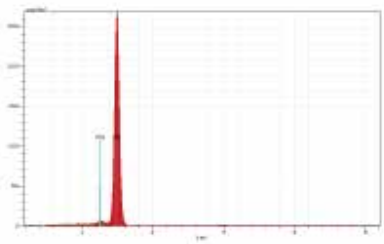
Surface



Cross section

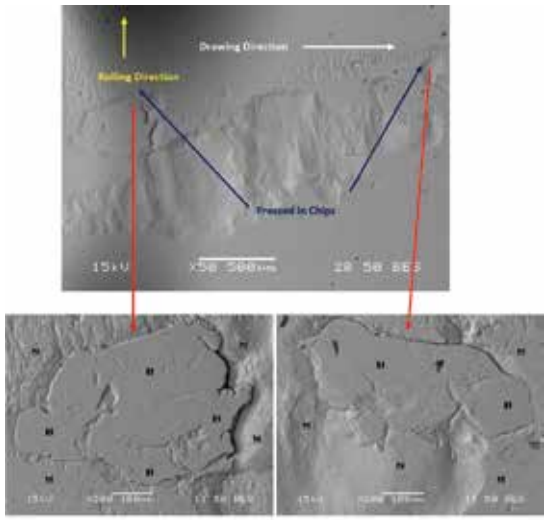


Site 2 - Al Mg Oxide or Spinel



Site 1 - Base Metal

Fig. 1 - SEM images showing inclusions entrapped within the can sheet



Pressed in aluminum chips observed - base metal at 2 and chips at 1 show same chemistry

Fig. 2 - Pressed in aluminum chips - could be from can maker or sheet manufacturer depending on defect orientation on sheet

Aluminum Art

Sculpture of Remembrance

The University of Kentucky Arboretum is home to the Flight 5191 Memorial. The sculpture captures forty-nine birds lifting off in flight – one bird for each of the individuals who died when Flight 5191 crashed at Blue Grass Airport on August 27, 2006.

Douwe Blumberg created the sculpture which is cast in magnesium aluminum alloy – a material that is strong and corrosion resistant. The material has been polished to a bright gloss that shines in the Kentucky sun.

Each bird in the memorial contains a canister holding mementos, shared by family members, of one of the people who lost their lives in the crash.

The memorial was dedicated on August 27, 2011.

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