eccomelt356.2 – an ecological and economical alternative to produce low Fe aluminum alloys

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Eccomelt LLC

- With the partnership of Alcan R&D, eccomelt356.2, a direct substitute for ingot, sow, or T-bar, was developed in response to a growing global need for new energy efficient and cost effective ways to process metals.
- With already over 700 million lbs produced and sold and an installed annual capacity of 72 million lbs. in the US and almost 50 million lbs in Canada, Eccomelt LLC (a subsidiary of House of Metals) is investigating further expansions both in North America and in Europe.

Production Process

Aluminum wheels (A356) → Wheel shredder → Patented cleaning process → eccomelt356.2

→ Melt sample →

→ Sample Button

Low Fe die casting alloys

2013 DIE CASTING CONGRESS &TABLETOP

NADCA
NORTH AMERICAN DIE CASTING ASSOCIATION

Mercalloy for Structural Diecasting

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- Analysis of impurity levels and their impact on castings
- Wheels are the ideal starting material for structural (low Fe) die casting alloys

	Sl	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Sr	other	total
Mercalloy 362.0	[illegible]	0.40	0.20	[illegible]	[illegible]	[illegible]	0.10	0.10	0.20	[illegible]	0.05	0.15
Mercalloy 367.0	[illegible]	0.25	0.25	[illegible]	[illegible]	[illegible]	[illegible]	0.10	0.20	[illegible]	0.05	0.15
Mercalloy 368.0	[illegible]	0.25	0.25	[illegible]	[illegible]	[illegible]	[illegible]	0.10	0.20	[illegible]	0.05	0.15

Low Fe die casting alloys

	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Sr	other	total
Mercalloy 362.0	[illegible]	0.40	0.20	[illegible]	[illegible]	[illegible]	0.10	0.10	0.20	[illegible]	0.05	0.15
Mercalloy 367.0	[illegible]	0.25	0.25	[illegible]	[illegible]	[illegible]	[illegible]	0.10	0.20	[illegible]	0.05	0.15
Mercalloy 368.0	[illegible]	0.25	0.25	[illegible]	[illegible]	[illegible]	[illegible]	0.10	0.20	[illegible]	0.05	0.15
Aural-2™	10-12	[illegible]	0.02	[illegible]	[illegible]	[illegible]	[illegible]	0.03	0.10	0.03	[illegible]	[illegible]
Aural-3™	10-11	[illegible]	0.02	[illegible]	[illegible]	[illegible]	[illegible]	0.03	0.10	0.03	[illegible]	[illegible]
Aural-5™	[illegible]	[illegible]	0.02	[illegible]	[illegible]	[illegible]	[illegible]	0.03	0.10	0.03	[illegible]	[illegible]
Castaman®-35	[illegible]	0.20	0.05	[illegible]	[illegible]	[illegible]	[illegible]	0.05	0.15	[illegible]	[illegible]	[illegible]
W3 (ADC3sf)	[illegible]	<[illegible]	<[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	<[illegible]	[illegible]
EZCast™ 370.1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.05	0.08	[illegible]	[illegible]	[illegible]
B360.0	[illegible]	0.40	0.25	0.40	[illegible]	0.50	[illegible]	0.50	[illegible]	0.12	[illegible]	[illegible]

- Many structural / low Fe die casting alloys available now

Low Fe die casting alloys

	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Sr	other	total
Mercalloy 362.0	[illegible]	0.40	0.20	[illegible]	[illegible]	[illegible]	0.10	0.10	0.20	[illegible]	0.05	0.15
Mercalloy 367.0	[illegible]	0.25	0.25	[illegible]	[illegible]	[illegible]	[illegible]	0.10	0.20	[illegible]	0.05	0.15
Mercalloy 368.0	[illegible]	0.25	0.25	[illegible]	[illegible]	[illegible]	[illegible]	0.10	0.20	[illegible]	0.05	0.15
Aural-2™	10-12	[illegible]	0.02	[illegible]	[illegible]	[illegible]	[illegible]	0.03	0.10	0.03	[illegible]	[illegible]
Aural-3™	10-11	[illegible]	0.02	[illegible]	[illegible]	[illegible]	[illegible]	0.03	0.10	0.03	[illegible]	[illegible]
Aural-5™	[illegible]	[illegible]	0.02	[illegible]	[illegible]	[illegible]	[illegible]	0.03	0.10	0.03	[illegible]	[illegible]
Castaman®-35	[illegible]	0.20	0.05	[illegible]	[illegible]	[illegible]	[illegible]	0.05	0.15	[illegible]	[illegible]	[illegible]
W3 (ADC3sf)	[illegible]	<[illegible]	<[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	<[illegible]	[illegible]
EZCast™ 370.1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.05	0.08	[illegible]	[illegible]	[illegible]
B360.0	[illegible]	0.40	0.25	0.40	[illegible]	0.50	[illegible]	0.50	[illegible]	0.12	[illegible]	[illegible]
eccomelt 356.2	**6.5-7.5**	**0.14**	**0.020**	**0.03**	**0.25-0.40**	**0.030**	**0.008**	**0.018**	**0.12**	**0.01**	**0.03**	**0.15**

- Most structural / low Fe die casting alloys could easily benefit from “clean” A356 wheels as starting material (eccomelt356.2)

Low Fe die casting alloys

	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Sr	other	total
Mercalloy 362.0	10.5-11.5	0.40	0.20	[illegible]	[illegible]	[illegible]	0.10	0.10	0.20	[illegible]	0.05	0.15
Mercalloy 367.0	8.5-9.5	0.25	0.25	[illegible]	[illegible]	[illegible]	[illegible]	0.10	0.20	[illegible]	0.05	0.15
Mercalloy 368.0	8.5-9.5	0.25	0.25	[illegible]	[illegible]	[illegible]	[illegible]	0.10	0.20	[illegible]	0.05	0.15
Aural-2™	10-12	[illegible]	0.02	[illegible]	[illegible]	[illegible]	[illegible]	0.03	0.10	0.03	[illegible]	[illegible]
Aural-3™	10-11	[illegible]	0.02	[illegible]	[illegible]	[illegible]	[illegible]	0.03	0.10	0.03	[illegible]	[illegible]
Aural-5™	7-8	[illegible]	0.02	[illegible]	[illegible]	[illegible]	[illegible]	0.03	0.10	0.03	[illegible]	[illegible]
Castaman®-35	8.5-10.0	0.20	0.05	[illegible]	[illegible]	[illegible]	[illegible]	0.05	0.15	[illegible]	[illegible]	[illegible]
W3 (ADC3sf)	7.5-8.5	<[illegible]	<[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	<[illegible]	[illegible]
EZCast™ 370.1	6.0-9.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.05	0.08	[illegible]	[illegible]	[illegible]
B360.0	9.0-10.0	0.40	0.25	0.40	[illegible]	0.50	[illegible]	0.50	[illegible]	0.12	[illegible]	[illegible]
eccomelt 356.2	6.5-7.5	**0.14**	**0.020**	**0.03**	**0.25-0.40**	**0.030**	**0.008**	**0.018**	**0.12**	**0.01**	**0.03**	**0.15**

- Si is already ideal for some alloys, for others 1-3 % need to be added (which is easy to do)

Low Fe die casting alloys

	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Sr	other	total
Mercalloy 362.0	[illegible]	0.40	0.20	[illegible]	[illegible]	[illegible]	0.10	0.10	0.20	[illegible]	0.05	0.15
Mercalloy 367.0	[illegible]	0.25	0.25	[illegible]	[illegible]	[illegible]	--	0.10	0.20	[illegible]	0.05	0.15
Mercalloy 368.0	[illegible]	0.25	0.25	[illegible]	[illegible]	[illegible]	--	0.10	0.20	[illegible]	0.05	0.15
Aural-2™	10-12	0.16-0.20	0.02	[illegible]	[illegible]	[illegible]	--	0.03	0.10	0.03	[illegible]	[illegible]
Aural-3™	10-11	0.16-0.20	0.02	[illegible]	[illegible]	[illegible]	--	0.03	0.10	0.03	[illegible]	[illegible]
Aural-5™	[illegible]	0.16-0.20	0.02	[illegible]	[illegible]	[illegible]	--	0.03	0.10	0.03	[illegible]	[illegible]
Castaman®-35	[illegible]	0.20	0.05	[illegible]	[illegible]	[illegible]	--	0.05	0.15	[illegible]	[illegible]	[illegible]
W3 (ADC3sf)	[illegible]	<0.2	<0.2	[illegible]	[illegible]	[illegible]	--	--	[illegible]	[illegible]	<[illegible]	[illegible]
EZCast™ 370.1	[illegible]	0.08-0.15	--	[illegible]	[illegible]	[illegible]	--	0.05	0.08	[illegible]	[illegible]	[illegible]
B360.0	[illegible]	0.40	0.25	0.40	[illegible]	0.50	--	0.50	[illegible]	0.12	[illegible]	[illegible]
eccomelt 356.2	6.5-7.5	0.14	0.020	0.03	0.25-0.40	0.030	0.008	0.018	0.12	0.01	0.03	0.15

- Maximum Fe, Cu, Cr, Ni, Zn and other impurities are perfectly met by eccomelt356.2

Low Fe die casting alloys

	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Sr	other	total
Mercalloy 362.0	[illegible]	0.40	0.20	**0.25-0.35**	**0.50-0.7**	[illegible]	0.10	0.10	0.20	**0.05-0.07**	0.05	0.15
Mercalloy 367.0	[illegible]	0.25	0.25	**0.25-0.35**	**0.30-0.50**	[illegible]	[illegible]	0.10	0.20	**0.05-0.07**	0.05	0.15
Mercalloy 368.0	[illegible]	0.25	0.25	**0.25-0.35**	**0.10-0.30**	[illegible]	[illegible]	0.10	0.20	**0.05-0.07**	0.05	0.15
Aural-2™	10-12	[illegible]	0.02	**0.45-0.55**	**0.25-0.35**	[illegible]	[illegible]	0.03	0.10	**0.03**	[illegible]	[illegible]
Aural-3™	10-11	[illegible]	0.02	**0.45-0.55**	**0.25-0.35**	[illegible]	[illegible]	0.03	0.10	**0.03**	[illegible]	[illegible]
Aural-5™	[illegible]	[illegible]	0.02	**0.45-0.55**	**0.15-0.25**	[illegible]	[illegible]	0.03	0.10	**0.03**	[illegible]	[illegible]
Castaman®-35	[illegible]	0.20	0.05	**0.45-0.70**	**0.20-0.45**	[illegible]	[illegible]	0.05	0.15	**0.1-0.3**	[illegible]	[illegible]
W3 (ADC3sf)	[illegible]	<[illegible]	<[illegible]	**0.3-0.4**	**0.2-0.3**	[illegible]	[illegible]	[illegible]	[illegible]	**0.01-0.02**	<[illegible]	[illegible]
EZCast™ 370.1	[illegible]	[illegible]	[illegible]	**0.35-0.6**	**0.10-0.6**	[illegible]	[illegible]	0.05	0.08	**--**	[illegible]	[illegible]
B360.0	[illegible]	0.40	0.25	**0.40**	**0.40-0.6**	0.50	[illegible]	0.50	[illegible]	**0.12**	[illegible]	[illegible]
eccomelt 356.2	6.5-7.5	**0.14**	**0.020**	**0.03**	**0.25-0.40**	**0.030**	**0.008**	**0.018**	**0.12**	**0.01**	**0.03**	**0.15**

- The Mn, Mg and Sr level can / must be adjusted to the ideal range (which is easy to do)

So can eccomelt356.2 be used to produce low Fe / structural die casting alloys?

- We have seen the chemistry is ideal for most structural / low Fe die casting alloys. But…
- … is the metal as clean as primary (A356)?
- … can it be melted in a foundry without fumes/smoke (i.e. without a bag house)?
- … will the melt loss be much higher than with ingots?
- Complete analysis at the Quebec Metallurgy Center in Trois-Rivieres, QC.

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Performed analysis at the CMQ

- Visual and surface contamination inspection
- Melting and analysis of dross formation / melt loss (compared to ingots), and emissions (fumes, smoke)
- Chemical analysis & H measurement
- Metal cleanliness analysis
- Casting test bars in permanent and sand molds (ASTM)
- Heat treatment of test bars
- Analysis of mechanical properties in different conditions
- Microscopic analysis

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Material as received at the CMQ

eccomelt356.2 was received in a “supersack”.

Metal was found to be very clean and in broken parts small enough to give a good compaction for charging and high density in the furnace.

Melting, molten metal treatment and analysis

A 275lb charge made from 100% eccomelt356.2 was prepared. Once molten at 730 °C the quality of the untreated charge was tested by the following methods:

- Hydrogen measurement by AlSCAN
- Hydrogen measurement by Reduced Pressure test (RPT)
- Test bars cast in permanent mold per ASTM B108.

Melting, molten metal treatment and analysis

The melt was then grain refined with 0.05 %Ti (Al%5Ti1B). It was then argon degassed with a Palmer rotary degasser for 20 minutes. The degassed and treated melt was tested by the following methods:

- Hydrogen measurement by AlSCAN
- Hydrogen measurement by Reduce Pressure test
- PoDFA for metal cleanliness (inclusions)
- Test bars cast in permanent mold per ASTM B108 (PDT samples)
- Test bars cast in Techniset® bonded resin sand mold per ASTM B26

Melting, molten metal treatment and analysis

- Melting in a Dynarad MG260 75 kW resistance furnace with a SiC crucible
- **No fumes/smoke during melting**
- Some floating skins of the last pieces of eccomelt356.2 were visible on the melt surface. Those oxides were skimmed off before sampling the untreated melt.
- **Total skim removed was 0.66 lb or 0.5% of the charge** (very acceptable and within what is normal for most charge materials)

Hydrogen content measurement

Hydrogen content was measured with AlSCAN and reduced pressure test. Results show a degassing level within normal industrial value of (0,09 to 0,15 ml/100g) after degassing.

Untreated: RPT Density 2.18, AlSCAN (0.365 ml/100g)

Degassed: RPT Density 2.66, AlSCAN (0.128 ml/100g)

PoDFA Analysis

- Metal cleanliness is ideally assessed with a hot PoDFA in the degassed melt. The PoDFA or Porous disk filtration apparatus is a method of molten cleanliness assessment wherein the molten metal is forced under vacuum to flow through a ceramic filter. The amount of inclusion per kg filtered and inclusion type is measured by metallography and expressed in mm^2/kg.
- Our PoDFA results show an average of 0.4 mm^2/kg, which is **well within what a typical wheel foundry would see when using primary A356.2 ingots for their melt**. We have not seen any issues with metal cleanliness using the eccomeot356.2 product and do not expect any foundry to require any treatments beyond regular foundry practices of proper metal filtering, degassing and possibly fluxing.

Chemistry of material as received and tested at the CMQ

Typical chemistry:

	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti
Max	7.500	0.140	0.020	0.030	0.400	0.030	0.008	0.018	0.150
Min	6.500				0.250				

	Ca	Li	Na	P	Pb	Sb	Sn	Sr	AL%
Max	0.005	0.0010	0.0020	0.010	0.010	0.002	0.010	0.0200	Remainder

Major elements of tested material:

	Si	Fe	Cu	Mn	Mg	Zn	Ti	others
eccomelt356.2 As received	7.0	0.11	0. 004	0.006	0.334	0.005	0.12	0.03

- **Chemical analysis of the metal as received was completely within A356.2 specification**

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Chemistry of material as received and tested at the CMQ

During melting the metal was slightly contaminated with some Fe in the crucible (which gives us “worst case chemistry” of eccomelt356.2, but this did not have a significant impact on properties achieved.

	Si	Fe	Cu	Mn	Mg	Zn	Ti	others
eccomelt356.2 as received	7.0	0.11	0. 004	0.006	0.334	0.005	0.12	0.03
eccomelt356.2 as melted	7.0	0.15	0. 011	0.006	0.348	0.005	0.10	0.03
eccomelt 356.2 degassed melt	7.0	0.15	0,006	0.006	0.338	0.005	0.13	0.03
A356.0 ASTM B108	6,5-7.5	0,20 max	0.20 max	0,10 max	0.25-0.45	0.10 max	0,20 max	0.15 max
A356.1 ASTM B179	6.5-7,.5	0,15 max	0.20 max	0,10 max	0.30-0.45	0.10	0.20 max	0,10 max
A356.2 ASTM B179	6.5-7,.5	0,12 max	0.10 max	0,05 max	0.30-0.45	0.05	0.20 max	0,10 max

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Chemistry of material as received and tested at the CMQ

Minor elements and impurities:

All within ASTM B179 specification!

	eccomelt356.2 as melted	eccomelt356.2 degassed melt	A356.0 ASTM B108	A356.1 ASTM B179
others	0.026	0.026	0.15max	0.10max
Others detail				
P	0.0007	0,0009	0.05 max	0.05 max
Cr	0.005	0.005	0.05 max	0.05 max
Pb	0.0015	0.0011	0.05 max	0.05 max
Li	0,0001	0.0001	0.05 max	0.05 max
Sr	0.009	0,008	0.05 max	0.05 max
Ni	0.006	0,006	0.05 max	0.05 max
V	0,01	0,010	0.05 max	0.05 max

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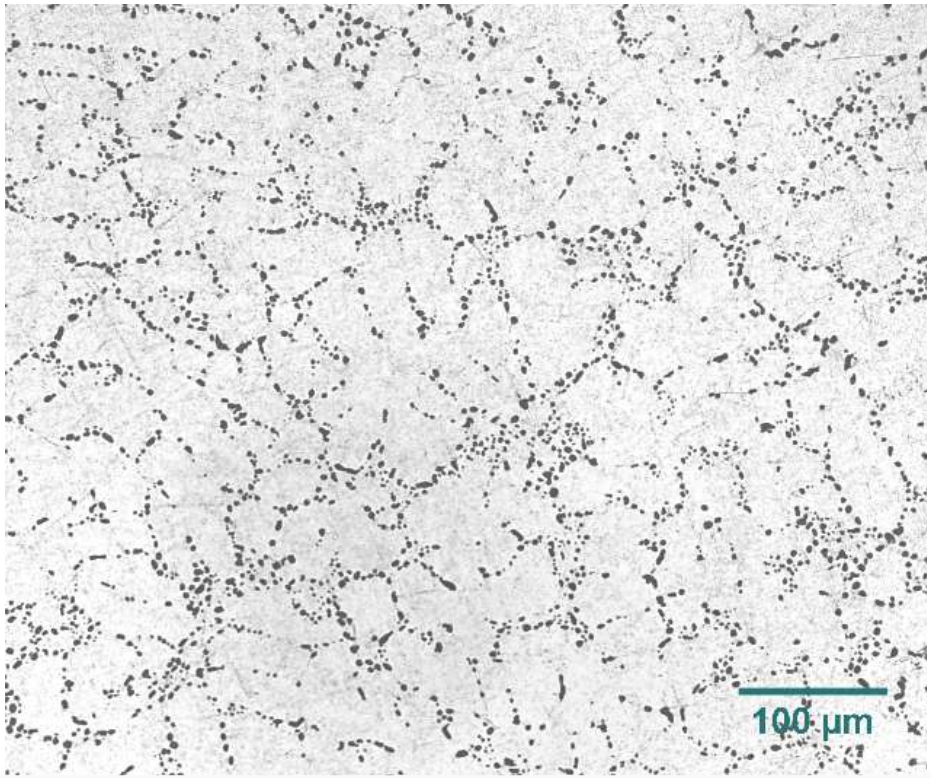
Modification and grain refinement

- Sr modification was not necessary (residual level of 88 ppm in the melt was measured before degassing and 79 ppm after degassing).
- A modification AFS Rating #5 (fully modified) was obtained.
- The melt was grain refined with 0.05 % Ti (Al%5Ti1B).



Tensile testing and results

- Tensile testing on test bars cast in PM to verify the effect of the degassing on the melt.
- The sand casting ASTM B26 gating had a filter installed at the bottom of the sprue.
- Hot isostatic pressing (HIP) done on 50 % of the PM test bars to obtain the best possible properties (with best in class foundry processes) since porosity is closed.
- Tensile testing was also performed on sand mold with the degassed treated metal, and the results were compared to ASTM B26 specifications.

As cast test bars, ASTM B26 sand mold above and B108 permanent mold below

Tensile testing and results

- All cast test bars were heat treated to T6 according to ASTM B917 and T61 with slight modification to ASTM B917 for best elongation.
- T6 for sand cast bars solution anneal to 540 °C for 9h, quench in water at 25 °C then aging to 155 °C for 4 hours the day after
- T61 for PM cast bars solution HT at 540 °C for 9h, quench in water at 25 °C then aging at 162 °C for 9 hours. (50% of the samples were treated by HIP at 535 °C 15000 psi for 2 hours prior to HT).
- A second series cast after fluxing and degassing (the same melt)

As cast test bars, ASTM B26 sand mold above and B108 permanent mold below

Mechanical properties achieved

Results of 8 tensile bars for the PM Series and 4 for the sand mold series.

Condition	T6 T61 Heat Treatment	YS ksi	UTS ksi	E %	Quality index MPa
Permanent mold Untreated	9 h at162 °C	32,8	39.2	4.3	370
Permanent mold Degassed	9 h at162 °C	33.8	44.4	8.4	446
Permanent mold Degassed + HIP	HIP + 9h at162 °C	33.4	45.6	12.1	477
Permanent mold Degassed +Flux	HIP + 9h at162 °C	32.7	45.1	9.6	459
Permanent mold Degassed + Flux+ HIP	HIP + 9h at162 °C	33.8	46.0	11.5	477
Permanent mold Separate test bars min value ASTM B108	6-12 h at 155 °C	28.0	38.0	5	367
Sand mold Degassed	4 h at155 °C	23,5	37,4	9,6	404
Sand mold Separate test bars min value ASTM B26	2-5 h at 155 °C	24.0	34.0	3.5	316

QI = UTS +150 log E in MPa

Mechanical properties achieved

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Condition	T6 T61 Heat Treatment	YS ksi	UTS ksi	E %	Quality index MPa
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Permanent mold Degassed + Flux+ HIP	HIP + 9h at162 °C	33.8	46.0	11.5	477
Permanent mold Separate test bars min value ASTM B108	6-12 h at 155 °C	28.0	38.0	5	367
Sand mold Degassed	4 h at155 °C	23,5	37,4	9,6	404
Sand mold Separate test bars min value ASTM B26	2-5 h at 155 °C	24.0	34.0	3.5	316

ASTM min. & very good QI values:

- 367MPa is minimum / 450MPa in PM is considered very good

Mechanical properties achieved

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Permanent mold Degassed + HIP	**HIP + 9h at162 °C**	**33.4**	**45.6**	**12.1**	**477**
Permanent mold Degassed +Flux	HIP + 9h at162 °C	32.7	45.1	9.6	459
Permanent mold Degassed + Flux+ HIP	HIP + 9h at162 °C	33.8	46.0	11.5	477
Permanent mold Separate test bars min value ASTM B108	6-12 h at 155 °C	28.0	38.0	5	367
Sand mold Degassed	4 h at155 °C	23,5	37,4	9,6	404
Sand mold Separate test bars min value ASTM B26	2-5 h at 155 °C	24.0	34.0	3.5	316

ASTM min. & very good QI values:

- 367MPa is minimum / 450MPa in PM is considered very good
- Best in class foundry processes can achieve a QI up to ≈470 Mpa

Mechanical properties achieved

Results of 8 tensile bars for the PM Series and 4 for the sand mold series.

Condition	T6 T61 Heat Treatment	YS ksi	UTS ksi	E %	Quality index MPa
Permanent mold Untreated	9 h at162 °C	32,8	39.2	4.3	370
Permanent mold Degassed	9 h at162 °C	33.8	44.4	8.4	446
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- Fluxing did not show additional improvement which means the melt was already very clean after first degassing and did not require fluxing or additional cleaning.
- 316 MPa min. / >400 MPa in sand is an excellent result with only degassed metal.

Mechanical properties achieved

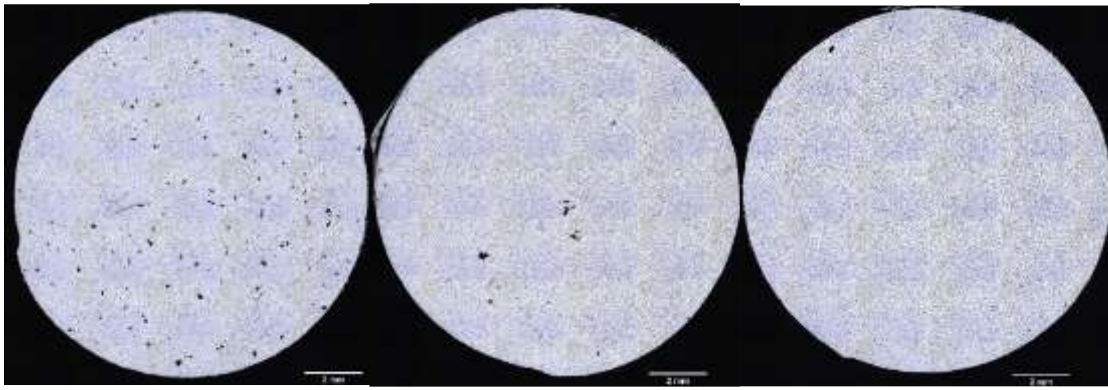
Test bars' fracture surfaces were visually inspected for inclusions:

- The untreated test bars presented some inclusions
- After degassing, only 1 out of 8 had one inclusion and a lower elongation of 4.9%.
- All other test bars from the degassed melt (4 sand cast and 8 permanent mold tested with and without HIP treatment) did not show inclusions in the fracture surface.
- I.e**. only 1 out of 20 test bars from the degassed melt had an inclusion on the fracture surface, which is an excellent result** and verifies the cleanliness of eccomelt356.2.

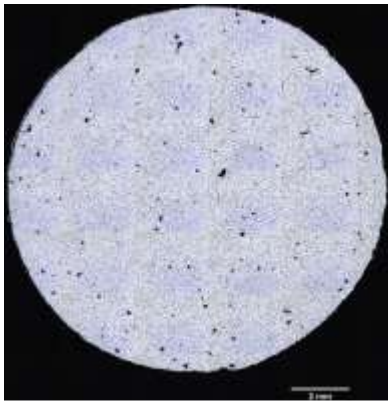
Microscopic evaluation - Porosity

Porosity vas evaluated by image analysis of the total surface in the reduced section.

- **Porosity in the PM bar was 0.67 % for the untreated, 0,36 % for the degassed melt and 0.02 % in the degassed melt after hipping.**
- Hipping has closed porosity (as expected)
- **Porosity in a sand cast test bar was found to be 0.53%.** (The lower speed of solidification in the sand mold is the reason for the higher porosity content when compared to PM)
- The **metal itself was very clean with no noticeable inclusions** that contribute to porosity



Typical porosity in the permanent mold test bars from left to right Untreated, Degassed and Degassed+HIP sample

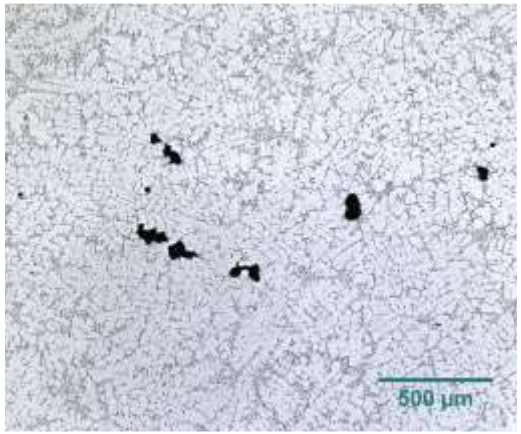


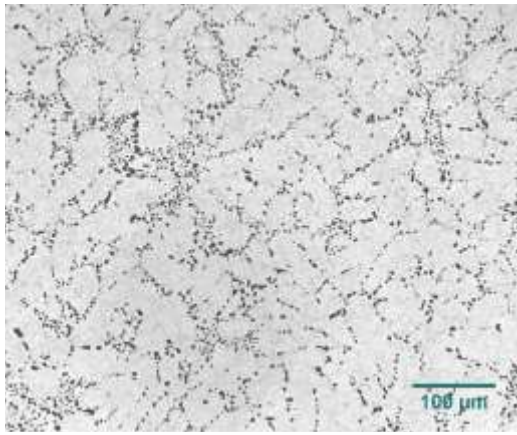
Porosity in a sand cast test bars

Dendrite arm spacing, strontium modification and structure

- The test bar cast from untreated metal shows normal/typical porosity
- A fine structure and AFS Rating #5 Fibrous silicon eutectic structure with no acicular phase (“fully modified”).

Untreated melt, permanent mold cast



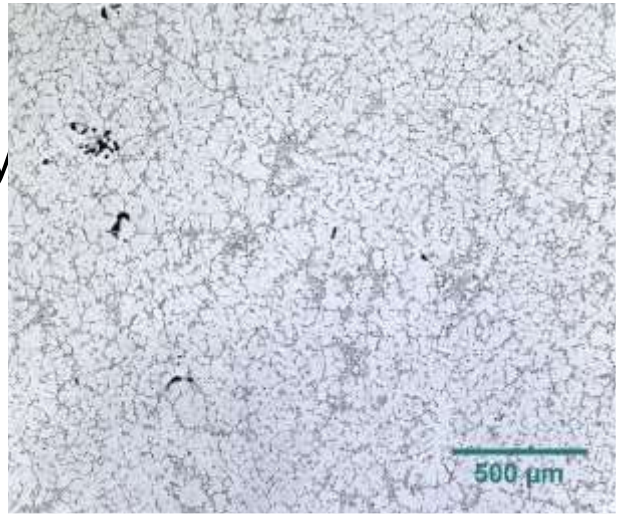


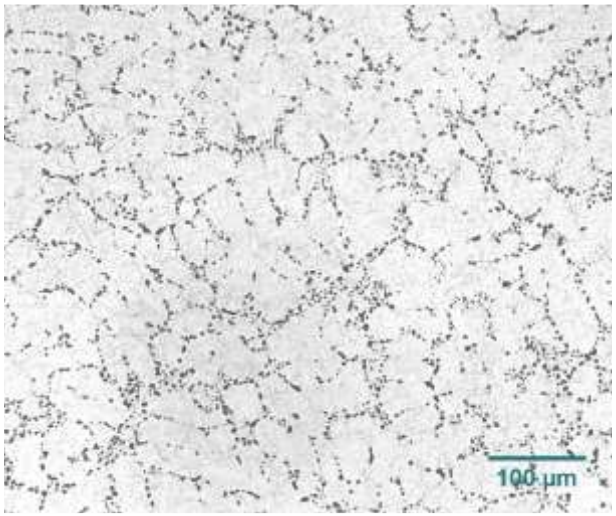
This means that if the eccomelt356.2 product is melted and immediately cast at a foundry, usually no extra Sr addition is required.

Dendrite arm spacing, strontium modification and structure

- The degassed metal shows some normal/typical porosity and a DAS equal to 30,9 µm with a standard dev 4,4 µm and equally a modification rating of #5.

Degassed melt, permanent mold cast

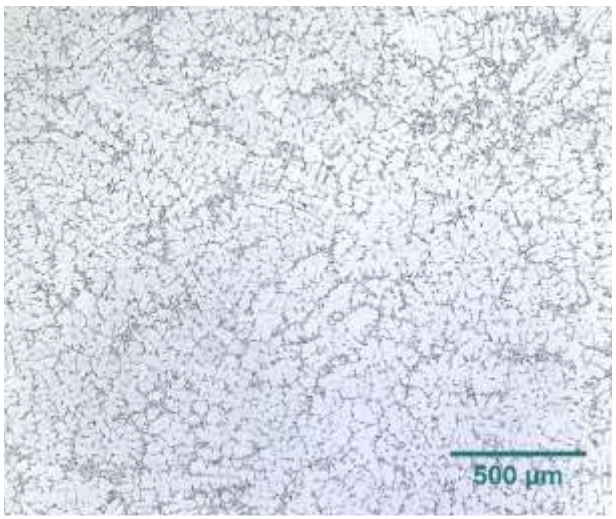


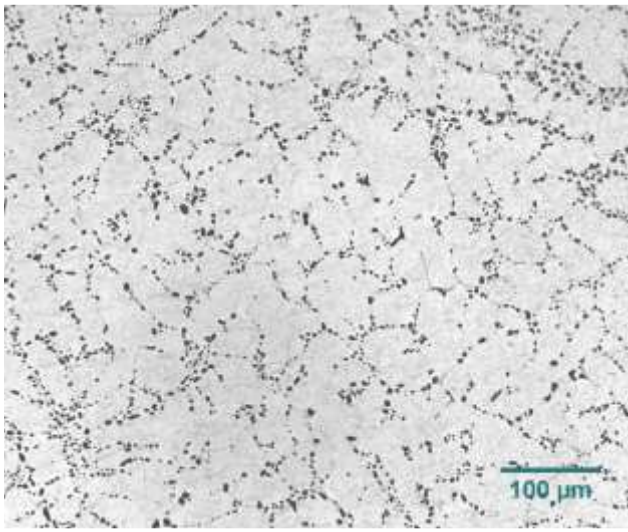


Dendrite arm spacing, strontium modification and structure

- Hipping at 15000 psi and at 535 °C for 2 hours did not change the structure but has closed the porosity.

Degassed melt after hipping, permanent mold cast





Economic and environmental aspects

- eccomelt356.2 is **already being used** by some smelters for the production of low Fe, high-quality Al-Si alloy ingots.
- Many foundries are using eccomelt356.2 directly, thereby becoming **more competitive** by benefiting from a lower price point, and eliminating one melting step with the additional logistics, handling, etc.
- This could be especially true for a multitude of (structural/low Fe alloy) die castings – also with a significant, **positive impact on the environment**.
- In addition, a multitude of components currently made by die casting (in secondary alloys) could benefit from the **higher quality and competitive input material** eccomelt356.2 is offering, which could result in lower Fe alloys with **significantly improved properties at competitive prices**.

Economic and environmental aspects

- Charging and melting time of eccomelt356.2 will depend on the furnace type and arrangement and the way it is charged. In most cases there will be **little difference in terms of charging time between eccomelt356.2 and small ingots, T-bars or sows** if the charging is done in the appropriate way.
- Melting time depends on the surface area to mass ratio which is much greater compared to ingots and especially T-bars or sows, so **generally melting is faster**, especially if the charge is immersed into molten metal.
- Increased surface area to mass creates more oxide surface and hence more dross generation. However, our CMQ testing shows that melt loss was low and quite comparable to ingots. It **will likely lead to approximately 0.5-1% more dross than ingots**.

Conclusions

- eccomelt356.2 is an ideal material to make most structural / low Fe Al-Si type die casting alloys in very high quality.
- It comes densely packed in supersacks at attractive pricing
- eccomelt356.2 is a very pure metal absolutely comparable to primary A356.
- The metal is very clean and filtering and degassing are sufficient, fluxing was not necessary in our trials.
- Melting is without any fumes or smoke and can be done in any existing melting furnace.
- Additional melt loss of 0.5 – 1% can be expected due to more surface area, but savings on material melting costs should easily more than compensate for this.
- eccomelt356.2 can help structural die casting become more competitive compared with other technologies and materials.

Questions?

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