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峰越科技
Fengyue Al.Grain Refiner

Focusing on High-end Grain Refinement Solutions

秦皇岛峰越科技有限公司

Qinhuangdao Fengyue Science & Technology Co., Ltd.

Company Profile

Qinhuangdao Fengyue Science & Technology Co., Ltd. was established in 2007, located in Qinhuangdao, China, close to Tianjin Port and Qinhuangdao Port, with convenient and efficient logistics.Our company has been cooperating with the Light Alloy Research Institute of Central South University and is committed to the research,development and production of high-end aluminum master alloys. The main products include:

Ⅰ. Aluminum Grain Refiner

1.Aluminum Titanium Carbon (Lanthanum/Platinum) - suitable for the production of aluminum wire rods and other conductive materials, as well as aluminum slab ingots and aluminum extrusion billits etc.;

2.Aluminum Lanthanum Boron - high-efficiency grain refiner for Al-Si casting alloy such as AlSi7Mg and AlSi11Mg(Sr).

The product has strong grain refining ability, long last refinement effectiveness, high purity and stable performance. It can effectively solve series of problems caused by the agglomeration and precipitation of TiB_2 particles in Al-Ti-B. At the same time, the addition amount can be reduced to one-half of Al-Ti-B, which can not only reduce production costs but also improve the product quality!

Ⅱ. 6%TiC Particle-Reinforcing Composite Material

We can produce nano- and micron-sized particles those are suitable for most wrought aluminum alloy products and cast aluminum alloy products which need to improve mechanical properties. They can strengthen the high-temperature/room-temperature mechanical properties and stability of the aluminum matrix through fine-grain strengthening, dispersion strengthening, etc.

Main Product List

Designation	Chemical components of Al–Ti–C (%)									Shape
	Color code	Ti	C	Fe	Si	V	Other each	Other total	Balance	
AlTi5C0.2Pt		4.7–5.3	0.17–0.23	0.20	0.20	0.05	0.03	0.10	Aluminum	Coil rod/ Cut rod
AlTi5C0.2La		4.8–5.2	0.18–0.22	0.20	0.10	0.05	0.03	0.10	Aluminum	
AlTi5C0.18		4.5–5.5	0.13–0.23	0.20	0.20	0.05	0.03	0.10	Aluminum	
AlTi3C0.15		2.6–3.4	0.08–0.22	0.20	0.20	0.05	0.03	0.10	Aluminum	
AlTi5C1.2		4.5–5.5	0.95–1.25	0.20	0.10	0.05	0.03	0.10	Aluminum	Waffle ingot

Designation	Chemical components of Al–La–B–RE (%)									Shape
	Color code	La	B	Ti	Fe	Si	V	Other each	Other total	Balance
AlLa2B1		1.6–2.4	0.5–1.0	≤1.00	≤0.20	≤0.10	≤0.05	≤0.03	≤0.10	Aluminum	Coil rod/ Cut rod
AlLa3B1.5		2.6–3.4	1–1.5	≤0.50	≤0.20	≤0.10	≤0.05	≤0.03	≤0.10	Aluminum

Packing Details:

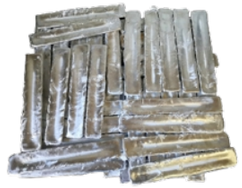
1. Coil rod : φ9.5mm; 185-210kg/coil, 3 coils /pallet; Dimension: 75*75*100cm
2. Cut rod : φ9.5mm; 50-100cm length; 25kg/carton, 1000kg/pallet
3. Waffle ingot : 4.5kg/pc,1000kg/pallet



Coil rod



Cut rod



Waffle ingot

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Aluminum Titanium Carbon

• ADVANTAGES •

Strong refinement ability

1. The nucleation rate of TiC is 10-50 times that of TiB_2 ;
2. Grain size : Al99.7 + 0.2% AlTi5C0.2 ≤ 180μm;
3. The addition amount could be 1/3-1/2 that of AlTi5B1.

No particles agglomeration

1. TiC particle size ≤ 2μm;
2. No slagging,which is beneficial to the purification of aluminum melt and uasge of foundry returns.

More uniform grain size from edge to center

Improve the mechanical properties and composition segregation.

Resistant to Zr/Cr "refinement poisoning"

Suitable for high-strength and heat-resistant aluminum alloys.

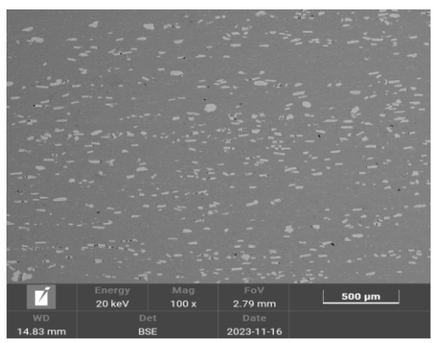
Long last refinement effectiveness

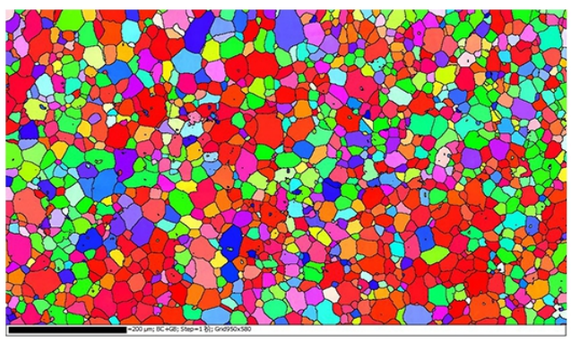
Last for 60-120 mins without decline.

Improve the corrosion resistance

Improve the cleaness of grain boundry.

Designation	Chemical components of Al–Ti–C (%)									Shape
	Color code	Ti	C	Fe	Si	V	Other each	Other total	Balance	
AlTi5C0.2Pt		4.7–5.3	0.17–0.23	0.20	0.20	0.05	0.03	0.10	Aluminum	Coil rod/ Cut rod
AlTi5C0.2La		4.8–5.2	0.18–0.22	0.20	0.10	0.05	0.03	0.10	Aluminum	
AlTi5C0.18		4.5–5.5	0.13–0.23	0.20	0.20	0.05	0.03	0.10	Aluminum	
AlTi3C0.15		2.6–3.4	0.08–0.22	0.20	0.20	0.05	0.03	0.10	Aluminum	





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• Industrial Applications:

Aluminum casting shape	Alloy Designation	Application	Addition Amount	Usage Feedback
Aluminum Slab	1070	Cosmetic packaging foil	0.20%	1.The grain size distribution of the slab refined by AlTi5C0.2La turns more uniform from the edge to the center. 2.The wrinkle defects and relative surface problems of 5XXX series of slabs are improved,and the shell thickness turns smaller and more even.The surface milling amount is decreased into 8~10mm each side from 20mm each side. 3.The addition amount is reduced by 20%–50%. 4.The luminance of the rolling plates is improved. 5.The chemical component segregation is improved.
	3003	Radiator fin	0.16%	
	3Z23		0.18%	
	5182	Easy–open can cover / pull ring materials	0.12%	
	5082/5083/5754	Anodizing materials	0.12%	
Aluminum Wire Rod	1350/1370	EC Aluminum wire	0.14%	1.The UTS turns to be more stable, and even is improved by around 5~6%. 2.The elongation is improved by 20%~90%;the defects is decreased; the drawing breaking off rate is decreased remarkably. 3.The electric conductivity is optimized,and even improved by 1%~3%. 4.The microstructure turns more uniform.
	1060		0.10%	
	5356	Welding wire	0.20%	
	6101/6201	Aluminum alloy wire	0.15%~0.20%	
	8XXX	Enamelled wire	0.15–0.35%	
Aluminum Billet	3003	Automotive radiator microchannel tube	0.14%	1.The addition amount is 1/3 –1/2 of AlTi5B1 on 6XXX alloys,the grain size is stably controlled and uniform,and the dark line defect rate is reduced significantly. 2.Solve the agglomeration and segregation problem of TiB_2,to make the thin–walled aluminum products less hard spot inclusion problems. 3.The mechanical properties are improved. 4.The repair frequency of the extrusion mold is reduced. 5.It could overcome the "refinement poisoning" phenomenon caused by Zr, Cr on 7XXX alloys.
	5056	Camera lenses profiles	0.20%	
	6061	Tube profiles for bicycle, forged wheels	0.05%–0.20%	
	6013/6060/ 6063/6401	Automotive trims, 3C profiles	0.05%–0.16%	
	2014	Military products	0.20%	
	7050	Bicycle profiles	0.20–0.30%	
Casting Parts	211Z	Military products	3.0 kg/ton	The elongation of 211Z alloy is improved by 10%, and the mechanical strength is more stable.

• e.g. The surface situation of 5182 alloy slab



Refined by AlTi5B0.2

The wrinkle issue was Improved



Refined by AlTi5C0.2La

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Aluminum Lanthanum Boron -- Special for Al-Si Casting Alloys

It is a high-efficiency grain refiner suitable for Al-Si casting alloys, which has a strong ability to refine α-Al in Al-Si casting alloy, and can strengthen the modification effect of Al-Sr alloy on β-Si. The nucleation particle LaB_6 has high melting point (2715℃), high hardness, low thermal expansion rate, and stable chemical properties. It can significantly enhance the wear resistance and hardness of cast alloys, and improve the fluidity and mechanical properties.

• ADVANTAGES •

Strong refinement ability onAl-Si alloy
The addition amount could be 1/4-1/2 that of AlTi5B1.

Save production cost
Consumption cost of grain refiner could be saved more than 50%.

No particles agglomeration
No slagging,which is beneficial to the purification of Al-Si alloy melt and uasge of foundry returns.

More uniform grain structures
Improve the porosity defects and stablize the mechanical properties.

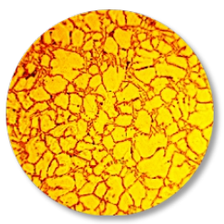
Long last refinement effectiveness
Last over 300 mins without decline.

Helpful for β-Si modification.
Reduce the consumption amout of Al-Sr alloys.

Designation	Chemical components of Al–La–B–RE (%)										Shape
	Color code	La	B	Ti	Fe	Si	V	Other each	Other total	Balance	
AlLa2B1		1.6–2.4	0.5–1.0	≤1.00	≤0.20	≤0.10	≤0.05	≤0.03	≤0.10	Aluminum	Coil rod/ Cut rod
AlLa3B1.5		2.6–3.4	1–1.5	≤0.50	≤0.20	≤0.10	≤0.05	≤0.03	≤0.10	Aluminum	





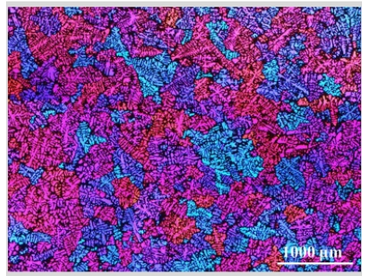


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• Industrial Applications:

Ⅰ. AlLa3B1.5 application on steering knuckle:



4-(AlLaB-0.1%)

Grain Refiner	Addition Amount	S/N	UTS Rm (Mpa)	YS Rp0.2 (Mpa)	Elongation (%)
AlLa3B1.5	0.1%	1	344.38	282.27	12.42
		2	340.86	277.96	10.25
		3	345.47	281.24	11.43
		4	351.91	288.26	13.50
		5	342.77	283.17	10.59
		6	347.28	278.94	12.21

1. The average grain size was smaller refined by AlLa3B1.5 (298.3±45.95 μm) than that by AlTi5B1 (350±45.95 μm).
2. The UTS was stably controlled over 340Mpa by using AlLa3B1.5.

Ⅱ. AlLa3B1.5 application data on aluminum wheels & Cost saving ability:

Grain Refiner	Additon Amount	Additon Amount	Mechanical Property			Unit Price (USD)	Cost for each ton aluminum melt (USD)
			YS Rp0.2 (Mpa)	UTS Rm (Mpa)	Elongation (%)		
AlTi5B1	2.0kg/ton	Internal flange	160	254	14.6	4.05	8.10
		External flange	161	256	14.8		
		Spoke	155	217	4.1		
		Rim	158	229	6.8		
AlLa3B1.5	0.7kg/ton	Internal flange	167	259	12.0	4.3	3.01
		External flange	164	257	15.5		
		Spoke	156	226	5.7		
		Rim	164	242	8.9		

The production cost could be saved USD 50,900.00 per 10,000 tons of aluminum melt!

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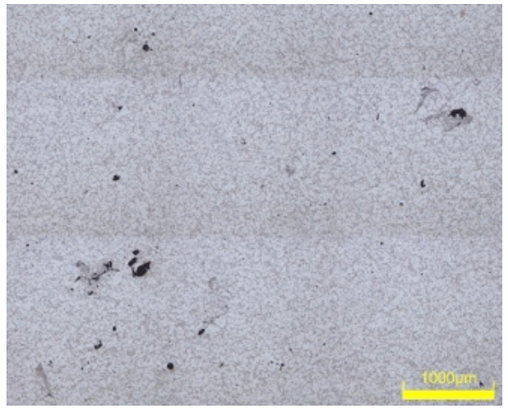
6% TiC Particle-Reinforcing Composite Material - AlTi5C1.2

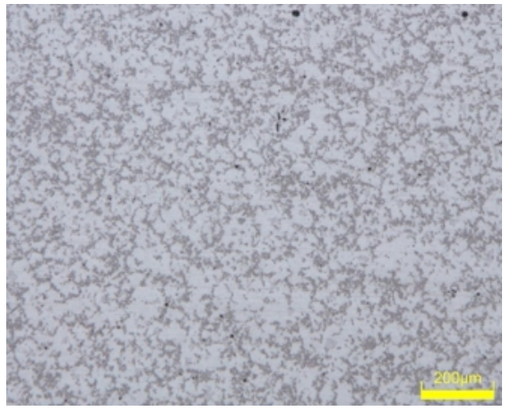
The AlTi5C1.2 master alloy contains 6wt% titanium carbide (TiC) particles. On the one hand, these particles serve as heterogeneous cores, which can effectively refine the aluminum alloy grains and strengthen the aluminum matrix with fine grains. On the other hand,TiC atoms are bonded by strong covalent bonds, and have some characteristics similar to metals, such as high melting point(3140°C) and boiling point (4820°C), good thermal stability, hardness greater than 9. They can be uniformly distributed to strengthen the aluminum matrix.

• Improve mechanical strength and ductility at the same time!

Effectiveness time ≥ 6 hours	Added into furnace
High thermal stability to improve high tempareture mechanical properties.	TiC has high lattice matching with α-Al, no impact or even improve ductilities.

Specification	Chemical components %							
	Ti	C	Fe	Si	V	Others each	Others total	Al
AlTi5C1.2	4.5–5.5	0.95–1.25	≤0.20	≤0.10	≤0.05	≤0.03	≤0.10	Balance

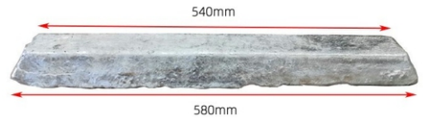


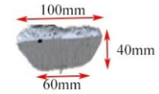


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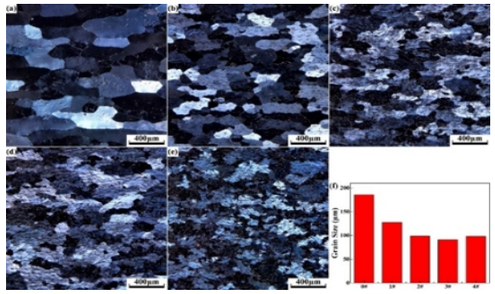
• Specifications: Waffle ingot, 4.5 kg/pc



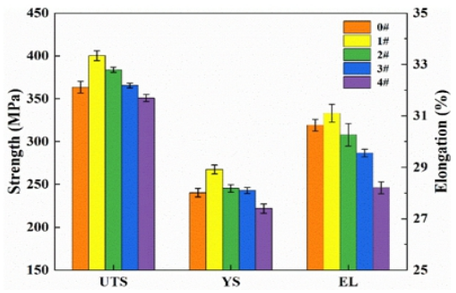


• Applications:

1. Microstructure and Mechanical Properties of TiC/2219 composite:



Microstructure of TiC/2219 composites with different particle contents: (a) 0.0wt%, (b) 1.0wt%, (c) 2.0wt%, (d) 3.0wt%, and (e) 4.0wt% and (f) Average grain size of the composite



Comparison of mechanical properties at room temperature of TiC/2219 composites with different particle contents

2. AlTi5C1.2 reinforced mechanical properties data of 6xxx alloys:

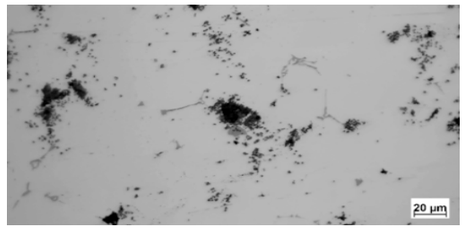
Mechanical property test result of the 6xxx alloy reinforced by AlTi5C1.2

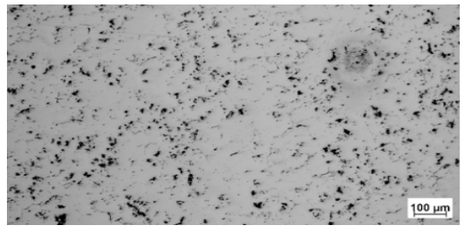
Designation	Addition amount of the TiC particles (wt%)	Position to add the TiC	Foundry technology
AlTi5C1.2	0.5	Into the furnace	Gravity casting

Vickers hardness test comparison data:

S/N	Vickers Hardness (Hv)	
	6xxx base alloy	6xxx base alloy + 0.5wt%TiC particles
1	59.4	66.5
2	58.8	66
3	57.2	64.1
4	59.9	76.7
5	59.3	69
6	59	66.2
Average	58.9	68.1

Result:
1.The Vickers hardness of 6xxx base alloy + 0.5wt% TiC particles has been improved by 15.6% than the 6xxx base alloy.
2.Mechanical properties: The Yeild strength has been improved over 20%,tensile strength has been improved by 10%,and elongation has been slightly decreased.





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