ALUMINUM BORON

The electrical conductivity of aluminum can be dramatically improved by the addition of tightly controlled amounts of boron to eliminate the undesirable effects of chromium, titanium, vanadium, and zirconium. Aluminum boron master alloys in the form of waffle, bar, or continuous feeding rod provide a convenient mechanism for making the desired boron addition. Boron has also been acknowledged as an effective grain refiner for aluminum silicon alloys.

AMG Aluminum produces master alloys of AlB_{12} and AlB_2 phase morphology dependent on boron concentration. AlB_{12} particles are large and settle quicker while AlB_2 particles are smaller and are less likely to produce sludge buildup in the furnace. Both types of particles react immediately when introduced into molten aluminum and form borides of Cr, Ti, V, and Zr.

			Chemical Composition (maximum unless shown as a range)								
Alloy	Designation	Color Code	B	Si	Fe	Ti	K	Na	Others Each	Others Total	Form
3% Boron	AA-H2203	red, yellow	2.5 - 3.5	0.20	0.30		1.0	0.50	0.03	0.10	Waffle Ingot
	CEN-90500	yellow	2.5 - 3.5	0.30	0.30				0.04	0.10	
4% Boron	AA-H2204	red, yellow	3.5 - 4.5	0.20	0.30		1.0	0.50	0.03	0.10	Waffle Ingot
	CEN-90502	yellow	3.5 - 4.5	0.30	0.30				0.04	0.10	
5% Boron	AA-H2217	red, yellow	4.5 - 5.5	0.20	0.30	0.05	1.0	0.50	0.03	0.10	Waffle Ingot, Rod
	CEN-90504	yellow	4.5 - 5.5	0.30	0.30				0.04	0.10	
6% Boron			5.5 - 7.0	0.30	0.40	0.10	0.50	0.50	0.04	0.10	Waffle Ingot
8% Boron	AA-H2222	red, yellow	7.5 - 9.0	0.25	0.30	0.05	1.0	0.50	0.03	0.10	Waffle Ingot
10% Boron		red, yellow	9.0 - 11.0	0.30	0.35	0.08	1.0	0.50	0.03	0.10	Waffle Ingot

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Determination of addition quantity

The amount of aluminum boron required to remove unwanted chromium, titanium, vanadium, and zirconium as insoluble borides is easily calculated. The following "rule of thumb" equations, which are simplified versions of the stoichiometric equations, may be used for determining the amount of aluminum boron required.

Mass Addition Calculation: Waffle and Bar

$$B = \left(\frac{M}{P}\right) * \frac{Cr+Ti+V+Zr}{2}$$

Where:
B = Total weight of aluminum boron required, pounds (kilograms)
M = Weight of aluminum to be treated, pounds (kilograms)
P = Concentration of boron in AlB master alloy, weight percent, i.e., 10, 8, 5, 4 or 3 percent
Cr, Ti, V, Zr = Concentration of impurity element, weight percent

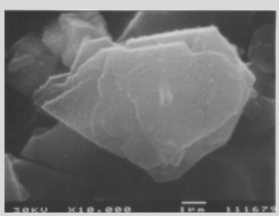
Addition Calculation: Continuous Rod

$$F = \left(\frac{R}{PW}\right) * \frac{Cr+Ti+V+Zr}{2}$$

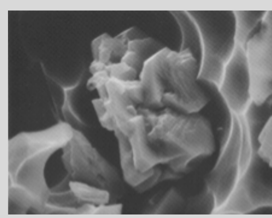
Where:
F = Feed rate, inches (meters) per minute
R = Aluminum flow rate, pounds (kilograms) per minute
P = Concentration of boron in aluminum boron, weight percent, i.e., 5, 4 or 3 percent
W = Weight per unit length of rod, 0.011 lbs. per inch (0.192 kilograms per meter)
Cr, Ti, V, Zr = Concentration of impurity element, weight percent

AlB_{12}
- Quick settling
- Available in 3% - 8%, 10%
- Available in waffle, sheared cast bar, and rod 3% - 5%

AlB_{12} Phase

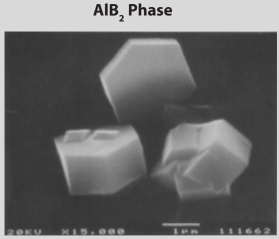


AlB_{12} Phase

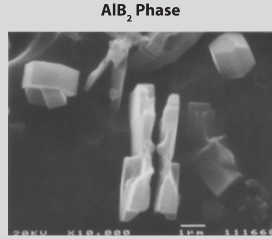


AlB_2
- Rapid reaction, minimal sludging
- Available in 3% - 5%
- Continuous feeding rod available for trough addition

AlB_2 Phase



AlB_2 Phase



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