H2007 10% Strontium-Aluminum

- Improved tensile strength
- Increased ductility
- Increased toughness
- Longer bath life than Sodium-modified metal
- Safer to handle than Sodium or 90% Sr-Al

Strontium is added to aluminum foundry alloys containing up to 12% Silicon to modify the shape of the Silicon eutectic. The presence of 0.015% Sr in the casting changes sharp cornered script Silicon to smooth, rounded fibrous particles. The tensile, elongation and impact toughness of the casting significantly improves because of the process.

A side effect of the Strontium modification is a redistribution of normal shrinkage porosity. Care must be taken to ensure proper gating, feeding and freezing of the casting in order to maximize the benefits of modification on the mechanical properties.

Although very reactive, Strontium will alloy with Aluminum and provide a longer treatment life in the molten alloy than will Sodium. Antimony does not modify the Silicon structure; rather, it refines the Silicon script into a fine, leaf-like structure. Strontium is also a safer choice than Antimony, which can create a health hazard in the foundry.

Recommended Addition Practice

The following furnace practice will result in optimal Silicon-Aluminum eutectic structural modification for foundry alloys containing up to 12% Silicon.

1. Adjust the composition to the required specification.
2. Flux and skim the bath using the normal practice.
3. Adjust the furnace temperature to 1340° to 1380°F (727° to 749°C).
4. Furnaces:

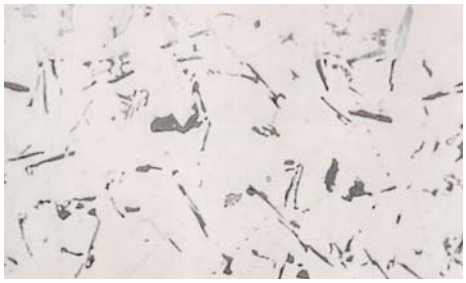
   a. For large conventional furnaces: Calculate a Strontium addition of 0.015 to 0.045% Sr based on the volume of the furnace, a master alloy composition of 10% Strontium, and a nominal Strontium recovery of 90%. For the first modification practice during a campaign, allow an additional 20% in order to condition the furnace.

   b. For small crucible furnaces:

   Calculate a Strontium addition of 0.015 to 0.04% Sr based on the volume of the crucible, a master alloy composition of 10% Strontium, and a nominal Strontium recovery of 90%.
5. Add the master alloy waffles or pieces to the bath about 10 minutes prior to casting. Distribute the addition around the bath as much as practical, keeping in mind that Strontium must be diluted between 500 and 1,000 times.
6. After five (5) minutes have elapsed, stir the bath and apply any regular degassing treatment using Nitrogen or Argon gas.

   Note: Never apply a chloride or fluoride fluxing treatment to a Strontium bearing alloy as that will effectively remove the Strontium.
7. Skim the surface prior to transfer or casting.
8. At a nominal 0.04% Sr addition, operating in a quiet, non-oxidizing environment at 1335°F (724°C), the modification treatment should remain effective for four to eight hours.

10% Sr-Al (200X) un-etched: *The matrix is Aluminum, and the large gray particles are primary SrAl4 surrounded by partially divorced SrAl4-Al eutectic. Some FeAl3 is visible at the grain boundaries.*



7% Silicon-Aluminum (400X) un-etched: *No Strontium was added to this casting. The unmodified structure consists of very coarse Silicon particles in the Si-Al eutectic. These particles reduce ductility.*

7% Silicon-Aluminum with 0.04% Sr (400X) un-etched: *The Silicon-Aluminum eutectic is a fully modified structure. This casting was made eight hours after the 10% Sr-Al was added to the bath. This modified structure offers improved mechanical properties and better cast ability.*

Physical Properties

2.7g/cc

Chemical Properties

Composition Element (in percent)

H2007	Sr	Fe	Si	Mg	Ba	Ca	P
Maximum	11.0	0.30	0.20	0.05	0.10	0.03	0.01
Minimum	9.0	-	-	-	-	-	-
Typical	10.0	0.12	0.04	0.002	0.03	0.02	0.005

Charge Calculation for Strontium Additions

$$\text{Wt. 10\% Sr-Al} = \frac{(\text{Weight of Bath} \times 0.0004)}{0.1} \times (1.11)$$

Forms Available

Waffle Ingot - 16 lbs. (7 kg)

ACU-STIX - 0.980-in. (22.5 mm) Extruded Rod

- 4-oz. (100 g) pieces - approx. 4 in. (10 cm)
- 6-oz. (150 g) pieces - approx. 6 in. (15 cm)
- 8-oz. (200 g) pieces - approx. 8 in. (20 cm)

Custom length ACU-STIX on request

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