

Manganese Sulfide Plus

ACuPowder MnS⁺ is manufactured using a patented process. The uniqueness of this process provides significant improvements in both critical characteristics of the powder and machineability when compared to competitive products.

ACuPowder MnS⁺ Provides the Following Advantages:

- Enhanced machineability
- Lower oxygen levels
- Improved particle size distribution
- Greater protection against attack by atmospheric moisture

The improved machinability with MnS⁺ additions as depicted in Figure 1 (see back of this sheet) is the result of carefully controlled particle size distribution, combined with lower oxygen levels (Figure 2). Particle size distribution is controlled by several screening, jet milling, and air classification steps in the production process. Oxygen levels, which have a very strong effect on machineability, are controlled by the use of inert gas during the production process. The significant improvement in the process and end product have resulted in a patented process.

MnS⁺ has very little effect on the physical and sintered properties of blends to which it is added in amounts less than 0.5%. Electron microscopy studies show that the MnS⁺ exists in the sintered part as free, chemically stable particles, basically occupying what would otherwise be open pores at typical part densities (6.8 g/cc). Thus, the effect on properties such as transverse rupture strength and hardness are minimal. During machining, however, these particles coat the tool with a cushioning and lubricating layer of MnS⁺.

The iron is an essential ingredient of MnS⁺ and is present, for the most part, as small, unalloyed particles. These iron particles help anchor the MnS⁺ particles in the microstructure and mechanically lock them in place. This holds the particle in place as the machine tool cuts through, coating the tool, rather than allowing the particle to be pulled out.

Another very important benefit of iron in MnS⁺ is the protection it provides against oxidation by moisture. Degradation of the previous versions of MnS in even normal atmospheric moisture is well known. The phenomenon often resulted in poor machineability in parts made with the exposed material. MnS⁺ is a much more stable compound with respect to moisture than competitive versions. The improved resistance of MnS⁺ to oxidation is demonstrated in Figures 3 and 4.

Product	Typical Chemical Analysis				Typical Particle Size		Application
	Iron	Sulfur	Manganese	Oxygen	D-50	D-95	
MnS ⁺	4-8	32-36	Balance	1	10 max	20 max	P/M, Machineability Enhancer

ISO 9001

*From industry pioneer to industry leader,
We are innovation in motion*

ISO 14001

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We have been part of your lives for over 90 years

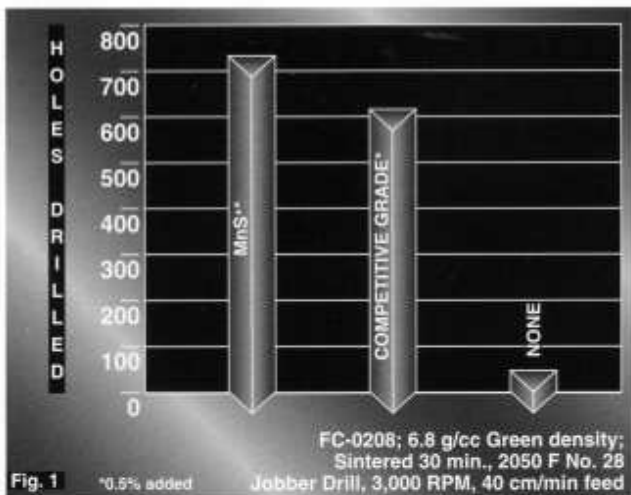


Fig. 1 *0.5% added

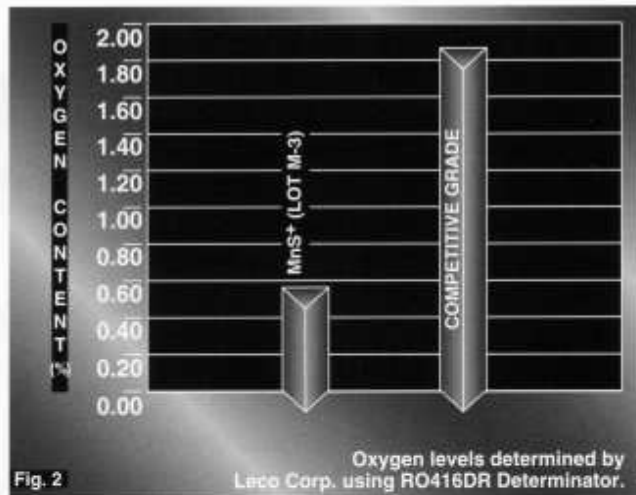


Fig. 2

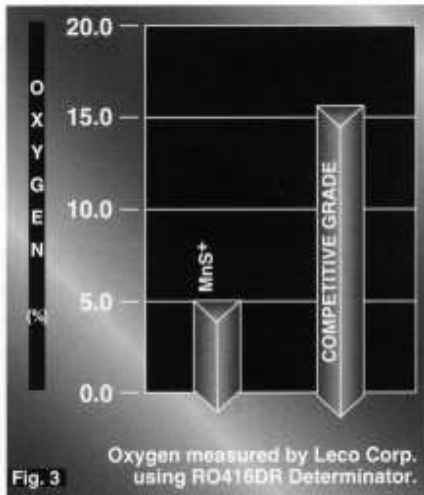


Fig. 3

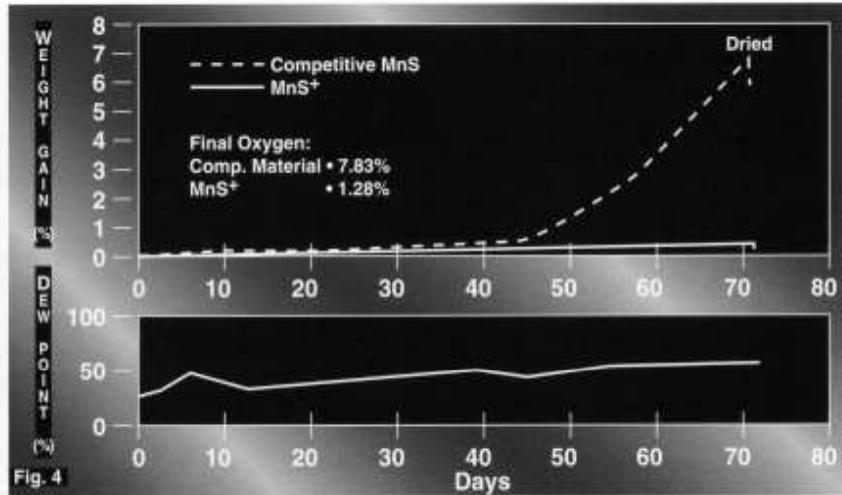
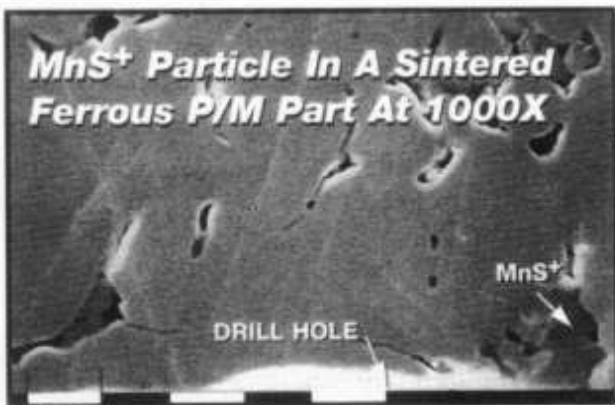
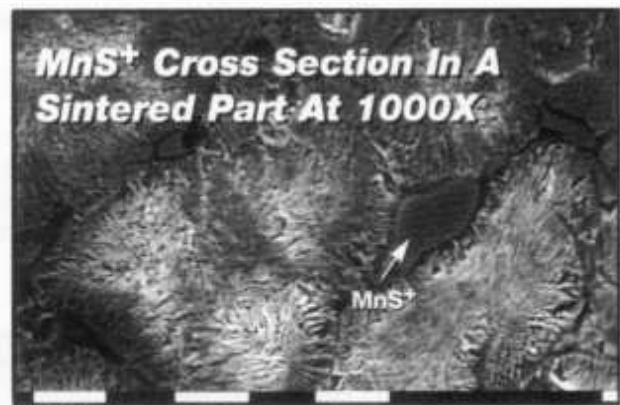


Fig. 4



SEM Micrograph Showing The Edge Of The Drill Hole. How Manganese Sulfide Coats The Drill



Etched Polished Cross Section Showing Manganese Sulfide

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We have been part of your lives for over 90 years