

International Advanced Research Centre for Powder Metallurgy & New Materials (ARCI)

Balapur P.O., Hyderabad – 500005, Telangana, India



Ultrafine Aluminum Powder for Propellant Applications

Overview

Ultrafine aluminum powder (UFAP) is commonly used in a wide variety of applications like rocket propellant additives, thermite mixtures, paints and hydrogen generation. The fineness of these powders allow ignition at lower temperature and due to their high surface area, the combustion is complete. Though UFAP can be synthesized by a number of techniques, radio frequency induction plasma (RFIP) offers inherent advantages over other techniques. The purity of the powder is ensured since RFIP setup has no electrodes. The productivity is also reasonably high ~0.5–1 kg/hr, depending upon the feed rate. The precursor powder is fed into the plasma plume by argon carrier gas which melts and vaporises due to high plasma temperature. The quench gas passed from the bottom of the plasma plume nucleates the vapours into nano-sized spherical particles which are collected in a filter.

Key Features

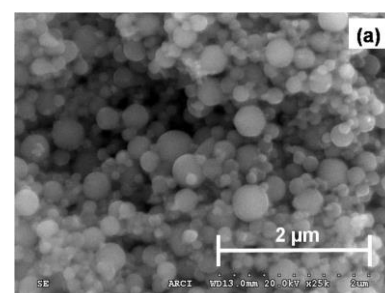
- Metallic aluminium content as high as 90%
- Increased burning rate due to nano-size
- Capability to make Al nano powder in large quantities
- Ability to tailor the particle size and its distribution
- Predominantly displays an exothermic peak compared to micron sized Al powder

Potential Applications

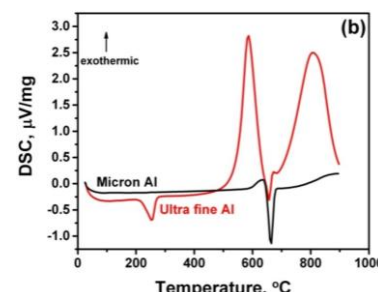
- Additives for both solid as well as liquid propellants
- Sintering additives
- Coating applications
- Thermite welding applications
- Hydrogen generation

Intellectual Property Development Indices (IPDI)

- Synthesis of powder at kg levels was demonstrated
- One kg of powder delivered to SF Complex, Jagdalpur, DRDO for field trials



SEM morphology of ultra fine Al powder



Thermal characteristics of ultra fine Al powder in comparison with micron sized powder

Status	1	2	3	4	5	6	7	8	9	10
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