

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

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



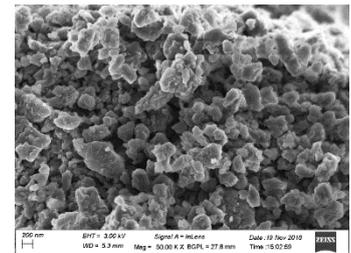
Air stable, hydrocarbon dispersible nano boron powder

Overview

Slurry fuels, which consists of hydrocarbon fuel and high-energy metallic elements, are considered as potential candidates to increase the energy density of conventional hydrocarbon fuels for air breathing propulsion applications.. Nano sized additives having large surface to volume ratio facilitate more contact area for rapid oxidation and hence their addition to fuel improves the thrust and overcomes the problems of ignition delay, burning time. Among various nano additives nano boron is considered as potential additive to liquid fuels due to its higher volumetric heat generation. Though nano boron can be made with other techniques, cryo milling method offers distinct advantages. Advantages of cryo mill are 1) powder is protected from oxidation during and after milling as it takes place in liquid nitrogen, 2) simple process and involves mass production, 3) handling of the powder after the milling is not difficult, 4) inexpensive process

Key Features

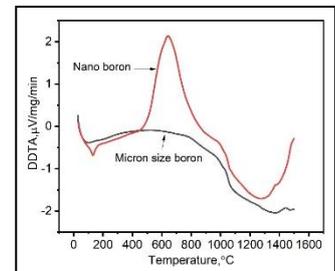
- Average particle size of nano boron is 200-300 nm
- Purity of the boron > 95%
- Surface area of the powder > 10.5 m²/g
- Dispersable in hydrocarbon fuel
- Handling of the powders is not difficult
- Capability to produce in large quantities.



SEM image of Nano boron

Potential Applications

- Slurry fuels for propellant applications
- Alloys and Composites



Thermal properties of nano boron

Technology Readiness Level (TRL) :5

- Synthesized and characterized the nano boron at laboratory
- Testing of the nano boron at industry is underway

IPDI*	1	2	3	4	5	6	7	8	9	10
Activities	Basic concepts and understanding of underlying scientific principles	Short listing possible applications	Research to prove technical feasibility for targeted application	Coupon level testing in stimulated conditions	Check repeatability/consistency at coupon level	Prototype testing in real-life conditions	Check repeatability/consistency at prototype level	Reassessing feasibility (IP, competition technology, commercial)	Initiate technology transfer	Support in stabilizing production
Status										

*IPDI : Intellectual Property Development Indices

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