Ferrosilicon Nitride

Technical Data & Application Guide
For tap-hole clay and iron-runner refractories

TECHNICAL NOTE | FSN-TG-01 | Revision 1.0 | 14 October 2026

Ferrosilicon nitride (FeSiN or Fe-Si-N) is a nitrided ferrosilicon material used as a powder additive in tap-hole clay and other iron-contact refractories. Evaluate nitrogen, silicon, iron-bearing phases, oxygen, particle-size distribution and compatibility with your binder. A published tap-hole clay experiment found better early corrosion resistance with Fe-Si-N addition, while longer heating increased porosity and reduced strength in some formulations. Qualify both service stages before replacing an existing additive. [1, 2]

Published ZHEN AN composition reference - 200 mesh powder

Item	Website reference [1]	Purchase acceptance
Total N / total Si	28-33% / 45-52%	Choose target and tolerance by application
Fe / oxygen	Fe: balance; O: 3.0% max	Request measured Fe and O results
Carbon / Al / Ca	C: 1.0%; Al: 1.5%; Ca: 1.0% max	Confirm applicable grade and methods
P / S / moisture	P: 0.05%; S: 0.05%; moisture: 0.5% max	Check analytical and receipt basis
Size / form	200 mesh / powder	Specify sieve aperture and minimum passing fraction
Packing	1 MT lined jumbo bag; small bags by order	Confirm liner, net weight and lot marks

Status: These are publicly listed reference values, not an attached shipment COA or a claim that every lot meets one exact composition. "200 mesh" alone does not state the fraction passing. Agree a signed specification, sampling method and lot COA before an order. Standards are cited by identifier, not presented as an unverified certificate of conformity.

View the 200 mesh product | Request a lot specification

Specify the phase, not just the name

FeSiN is a material family; it is not pure Si3N4 powder.

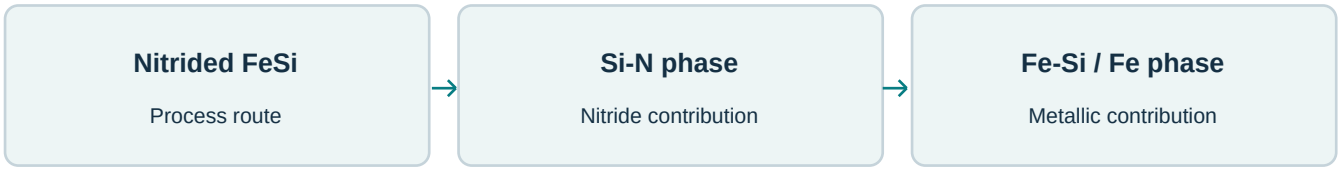


Figure 1. Conceptual phase description. Actual phases require batch characterization.

Nitriding ferrosilicon can produce a composite containing silicon-nitride phases and iron-bearing phases such as iron silicides, with possible residual metallic iron. Phase proportions depend on feedstock and process. The shorthand "Fe-Si3N4" describes a composite; it is not a single stoichiometric compound with one guaranteed formula. [2, 3, 4]

Material	What the term means here	Procurement implication
Ferrosilicon nitride	Nitrided Fe-Si composite; nitride plus iron-bearing phases	Request total elemental N/Si/Fe and, if needed, phase analysis
Silicon nitride powder	Si3N4-based powder with a different iron/impurity requirement	Do not substitute by matching total N alone
Ferrosilicon alloy	Fe-Si feedstock without a nitriding claim	Check nitriding and phase evidence
Si3N4-bonded SiC	Manufactured refractory article, not loose FeSiN additive	Separate product and test specification

Total N is not the measured Si3N4 phase fraction

If **all** nitrogen were in Si3N4, 30.0 wt% N would correspond mathematically to about **75.1 wt% Si3N4** (30.0 × 140.28 / 56.03). That is a conditional mass balance, not a measured phase result. Other nitrogen-bearing phases, unreacted materials and the chosen analytical basis can invalidate that conversion. Request a stated phase method when Si3N4 content is contractual.

Standard and process boundary

YB/T 4239-2010 identifies ferrosilicon nitride as an industry-standard subject; verify the applicable grade and full clauses in the official text before claiming conformance. Historical patent US4150999A describes a particular water-treatment route for a ferrosilicon nitride composite. The patent establishes a possible route and a binder-compatibility issue, not the process used for this shipment. [5, 3]

Balance early benefit and long exposure

The right loading depends on the whole clay recipe and service cycle.

A primary tap-hole-clay study compared formulations containing 15-30% Fe-Si3N4, with 3-hour and 12-hour heat treatments. In its system, increasing the additive improved the short-heated corrosion result up to a plateau around 25%; after longer heating, higher loading could increase porosity and decrease modulus of rupture. These laboratory percentages are **experimental formulation levels**, not recommended ZHEN AN dosage or field-life guarantees. [2]

Design decision	Why it matters	What to test
Initial sealing and corrosion	Early slag/iron attack occurs before prolonged thermal exposure	Short heat schedule; corrosion index; workability and drillability
Longer thermal exposure	Phase reactions and gas release can change porosity and strength	Long heat schedule; porosity, weight loss and cold/hot strength
Carbon and SiC balance	These ingredients interact with nitride and iron-bearing phases	Hold binder and carbon constant while comparing candidate additions
Binder compatibility	Water-containing systems may interact with reactive metallic phases	Mix temperature, workability window, expansion and gas evolution
Operating outcome	Lab trends require plant confirmation	Tap length, opening behavior, wear and retained samples

What the published result can and cannot establish

The observed short-heating corrosion improvement is evidence for the studied recipe. It does not prove a universal improvement in every pitch, tar, resin or water-bonded system. The same study reports degradation after longer heat exposure under some conditions. Use it to define a balanced trial matrix, not to copy a single percentage into a production formula. [2]

Trial design: Compare your control recipe with two or three candidate levels. Keep aggregate grading, binder content, carbon source, curing and heat treatment comparable. Record the powder chemistry and sieve distribution for every test batch; repeat promising conditions before a plant trial.

Make the COA usable

Separate total-element chemistry, phase identity and particle-size distribution.

Requested record	Acceptance question
Identity and traceability	Do lot ID, manufacture/test dates, net mass and bag marks match the allocated material?
Elemental chemistry	Are N, Si, Fe, O, C, P and S reported with units, test methods, detection limits and dry/as-received basis?
Phase analysis when needed	Does XRD or another agreed method identify the Si3N4 polymorphs and iron-bearing phases? Is quantification validated?
Free metal / free silicon	Are separate free-Fe/free-Si limits needed for your binder and service conditions? Total Fe and Si are not substitutes.
Powder size	What mass fraction passes the named sieve, what is retained, and what is the moisture-adjusted sample basis?
Moisture and packing	Does the agreed result represent the shipped lot and sealed package condition?

Write "200 mesh" as a measurable requirement

A sieve designation without the standard or opening size can be ambiguous. A buyer document supplied for comparison describes 90% minimum passing a minus-200-mesh sieve for one FeSiN powder tender. That is an **example of specification wording**, not a ZHEN AN guarantee or a universal industry limit. Agree sieve series, aperture, passing fraction and test method in your purchase order. [6]

Free metallic phases can affect wet mixing

An older manufacturing patent discusses heat generation and changes in water-containing binder systems from reactive phases in ferrosilicon nitride. It does not mean every modern powder will behave the same way. If your clay uses water or a moisture-sensitive binder, run a small, controlled compatibility trial and request the current product-specific SDS. [3]

Dispute procedure: Define lot boundaries, incremental sampling, sample reduction, sealed referee samples and an independent laboratory before shipment. Preserve an unground sample for sieve testing; agree the phase and chemical tests separately.

Choose powder or lump deliberately

The same product label can refer to different feed sizes and purchase criteria.

Route	Form to evaluate	Critical checks
Tap-hole clay / trough mix	Fine powder with agreed sieve passing fraction	Dispersion, binder interaction, short/long heat results, O and free-metal limits
Ramming or castable refractory	Powder distribution selected for your recipe	Mixing behavior, setting/cure, permeability, oxidation and corrosion tests
Steel nitrogen addition	Lump or controlled granular form if qualified	Actual N and Si pickup, feed method, dissolution timing, P/S/C input

For steelmaking, first calculate the nitrogen and silicon input from the **batch measured** elemental results. A theoretical input is not the nitrogen recovered in steel. Sample the steel before and after matched additions and account for other additions, gas pickup/loss and the steel mass balance. The website lists powder and lump routes; availability and the exact grade must be confirmed. [1, 7]

Illustrative nitrogen input - no recovery claim

At 30.0% N by mass, 10 kg of additive contains 3.0 kg of measured total N. Into 100 tonnes of steel, complete retention would represent 30 ppm N before other effects. If a trial finds an apparent 50% retention under a defined practice, that contribution would be 15 ppm. The 50% is a hypothetical teaching input, not a material guarantee.

Do not transpose fiber research into a commercial COA

A separate paper synthesized silicon-nitride fibers from ferrosilicon under a particular research route. Fiber morphology and its reported microstructure do not establish the composition or performance of a commercial powder for tap-hole clay. Likewise, a mechanism manuscript available through SSRN is a preprint; it is useful for research context, not a lot specification. [8, 9]

Qualification boundary: One site does not imply interchangeable material across refractory and steelmaking uses. Agree form, chemistry, size, testing and process-specific acceptance independently.

Turn the technical need into an RFQ

Give us the recipe conditions and a testable acceptance rule.

Provide in your RFQ	Details that change the offer and qualification
Use and test case	Tap-hole clay, trough refractory or steel addition; binder/carbon system or steel grade
Composition	N and Si targets; O, C, P, S limits; free Fe/free Si and phase requirements if relevant
Form and size	Powder or lump; sieve aperture, passing/retained fractions or agreed lump range
Volume and packing	Trial quantity, monthly demand, bag size, moisture barrier and label information
Documents	Lot COA, test methods, product-specific SDS, sieve report and sampling agreement
Delivery	Destination, delivery term, required window and inspection arrangement

Packing, storage and receiving

The public 200-mesh product page lists lined jumbo bags and small-bag options by order. Confirm liner, seal, bag marks, net weight and the current SDS for the actual grade. Store dry and segregated by lot. On arrival, check moisture exposure, torn bags and label/COA matching before releasing the material into a production blend. [1]

Release checklist

Before shipment: Freeze the signed chemistry and sieve acceptance rule; review the allocated lot COA, package specification and documents.
On receipt: Verify seal and identification, take the agreed retained samples and test any item that the contract assigns to incoming inspection.

Commercial status: Reference composition is not a dated offer. Price, MOQ, availability and lead time depend on the selected lot, form, sieving yield, packing and delivery term. Confirm them in a current quotation.

REQUEST SPECIFICATION, COA & QUOTE

Send the target application, grade, particle-size acceptance and test schedule to **sale@zanewmetal.com**. [1]

Questions to settle before approval

01 Does 30% total nitrogen mean 75% Si3N4 is guaranteed?

No. The conversion assumes all nitrogen belongs to Si3N4. Request a separately agreed phase determination when Si3N4 fraction controls acceptance.

02 Is a 200-mesh label enough to approve a lot?

No. Specify the sieve standard, aperture and minimum percentage passing, plus any oversize or ultrafine limit.

03 Can I use the 25% addition in the published study as my clay recipe?

That value belongs to one laboratory formulation. Compare candidate levels against your binder, carbon source and heat schedule before choosing a plant recipe.

04 Why check both early and long heat exposure?

A formulation can gain early corrosion resistance while changing porosity and strength after longer heating. Test the service stages relevant to your tap cycle.

05 Does total Fe tell me the free-iron content?

No. Iron can be present in distinct phases. Agree a specific free-metal method and limit if your binder or process makes it important.

06 Can refractory-grade powder be used directly for steel nitrogen alloying?

Only after a steelmaking trial and a separate purchase specification. Check size and feedability, measured nitrogen pickup, silicon contribution and residual limits.

Related product and contact

Ferrosilicon nitride 200-mesh product
Ferrosilicon nitride application guide
Request a batch COA

Only a signed order specification and lot evidence define shipment acceptance. A research paper, patent or tender example describes a context; it is not a certificate for our product.

References and document scope

Reviewed 14 October 2026. Links are included for independent inspection.

[1] ZHEN AN: FeSiN 200-mesh product page
Published composition and packing reference; no current shipment COA supplied.

[2] Liu, Shao & Chiu: Effect of Fe-Si3N4 Addition on Taphole Clay
Primary six-page study; early corrosion and prolonged heating tradeoff under its stated formulation.

[3] US4150999A: Method for manufacture of ferrosilicon nitride
1979 patent; a historical process and binder-compatibility context, not our production route.

[4] Shatokhin et al.: SHS ferrosilicon nitride in tap-hole clay
2014 translated journal article mirrored on Scribd; specific SHS grade, not an interchangeable supply claim.

[5] Official industry-standard register: YB/T 4239-2010
Confirms standard number/title and publication/implementation dates; full grade clauses not reviewed.

[6] Government e-marketplace: FeSiN powder buyer specification
2024 tender example; search snippet accessible, PDF body unavailable during review.

[7] ZHEN AN: ferrosilicon nitride applications
Our published powder/lump positioning; actual grade and performance require qualification.

[8] Warner et al.: Synthesis of silicon nitride fibers from ferrosilicon
Published research on fibers; no commercial refractory powder data adopted.

[9] Peng et al.: High-temperature nitriding mechanism
SSRN research manuscript/preprint; not used for performance or specification limits.

[10] Yuan & Jiang: FeSiN and its refractory application
2019 journal record verified; abstract/body unavailable, so no technical values adopted.

[11] Supplied seller PDF: FeSiN for tap-hole clay
One-page seller reference; no third-party numeric limits transferred into our guarantee.

The 8 October 2026 market/SEO brief informed product boundaries and buyer tasks. Its unverified capacity, certification and indicative-market claims were not adopted as facts for this grade. This technical guide is neither a batch COA nor a product-specific SDS.