



>>Entry Name: Silicon(IV) nitride (Si₃N₄)

CAS Registry Number: 12033-89-5

Si₃N₄

Molecular Formula: N₄Si₃

Molecular Weight: 140.283

Accurate Mass: 139.943077

Percentage Composition: N 39.94%; Si 60.06%

Source/Synthesis: Synth. from elements >1300°; or from SiO₂ + C + N₂H₂ at 1500°. Films prod. by "remote" plasma-enhanced CVD of (C₅Me₅)SiH₃ at 200° have v. low levels of O contamination. High-purity, single-crystal fibres (β-form), several mm in length, obt. from self-propagating, high temp. synth reaction: Si powder (+ trace amounts of Al and Fe) + NH₄F + β-Si₃N₄ at 1600°, under N₂ at 100 atm; low-cost process

Use/Importance: Finds wide application as an advanced ceramic material and in the form of whiskers. Potential uses as fibres in metal- and ceramic matrix complexes

Physical Description: Grey-white amorphous powder; chemically inert; insulator. White wool-like fibres

Melting Point: Mp 1900° (under pressure)

Solubility: Insol. H₂O; sol. HF

Other Data: Hardness: 9 Mohs. High-purity fibres stable at T ≤ 2000°; fibres exhibit extremely high tensile strengths (30-50 GPa), highest reported for crystalline fibres

Aldrich: 24862-2

Fluka: 85367

Sigma: S1023

References:

Mukerji, J. *et al.*, *Indian J. Technol.*, 1978, **16**, 156, (*synth, morphology*)

Gruen, R., *Acta Cryst. B*, 1979, **35**, 800, (*cryst struct*)

Dupree, R. *et al.*, *J. Mater. Sci. Lett.*, 1985, **4**, 393, (*Si-29 nmr*)

Ermer, E. *et al.*, *J. Mol. Struct.*, 1986, **143**, 5, (*ir*)

Baratan, M.I., *J. Mol. Struct.*, 1986, **143**, 9, (*ir*)

Lange, H. *et al.*, *Angew. Chem., Int. Ed.*, 1991, **30**, 1579, (*use, rev*)

Dahlhaus, J. *et al.*, *Adv. Mater.*, 1993, **5**, 377, (*synth, manuf thin films, Auger, pe, ir*)

Rodriguez, M.A. *et al.*, *Adv. Mater.*, 1995, **7**, 745-747, (*fibre production, powder struct, tem, sem*)