

Pentachlorodisilane (PCDS)

Si_2HCl_5

CAS number	31411-98-0
UN number	UN 2988
Molecular mass	234,41 g/Mol
Appearance	colorless liquid
Boiling point	40 - 41 °C (35 hPa)

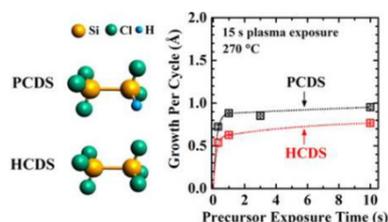
Pentachlorodisilane, synthesis grade, 5N

Product Number	1700
Purity	99.999% (by ICP-MS)
Assay	>95% (by NMR)
Application	low T SiN, SiO ₂ by ALD / CVD

Application Note

- „next generation“ precursor product for present silicon nitride HCDS applications
- higher PE-ALD growth rate under similar conditions than HCDS with excellent film properties

Source: Xing Meng et al, ACS Appl. Mater. Interfaces, 2018, 10 (16), pp 14116–14123



In this work, a novel chlorodisilane precursor, pentachlorodisilane (PCDS, HSi₂Cl₅), was investigated for the growth of silicon nitride (SiN_x) via hollow cathode plasma-enhanced atomic layer deposition (PEALD). A well-defined self-limiting growth behavior was successfully demonstrated over the growth temperature range of 270–360 °C. At identical process conditions, PCDS not only demonstrated approximately >20% higher growth per cycle than that of a commercially available chlorodisilane precursor, hexachlorodisilane (Si₂Cl₆), but also delivered a better or at least comparable film quality determined by characterizing the refractive index, wet etch rate, and density of the films. The composition of the SiN_x films grown at 360 °C using PCDS, as determined by X-ray photoelectron spectroscopy, showed low O content (~2 at. %) and Cl content (<1 at. %; below the detection limit). Fourier transform infrared spectroscopy spectra suggested that N–H bonds were the dominant hydrogen-containing bonds in the SiN_x films without a significant amount of Si–H bonds originating from the precursor molecules. The possible surface reaction pathways of the PEALD SiN_x using PCDS on the surface terminated with amine groups (–NH₂ and –NH–) are proposed. The PEALD SiN_x films grown using PCDS also exhibited a leakage current density as low as 1–2 nA/cm² at 2 MV/cm and a breakdown electric field as high as ~12 MV/cm.