

Compound Dissociation K-cell

Phosphorus, Arsenic, low cost alternative to valved crackers

The CDK35

Although it has been known for many years that the thermal decomposition of GaP and GaAs produces substantially P_2 and As_2 respectively⁽¹⁾, only recently has this method been seriously applied in MBE as a simpler, lower-cost alternative to two-zone valved crackers⁽²⁾ which operate with elemental red phosphorus (P_4) feedstock. On heating, red phosphorus sublimates and converts to the white P_4 allotrope, which must then be thermally cracked from a secondary buffer zone to produce the reactive P_2 species. In contrast, the CDK35 is a compound dissociation source consisting solely of a K-cell and a Ga trap. The source produces a beam of dimeric phosphorus / arsenic with extremely low parasitic Ga content and tetramer species.

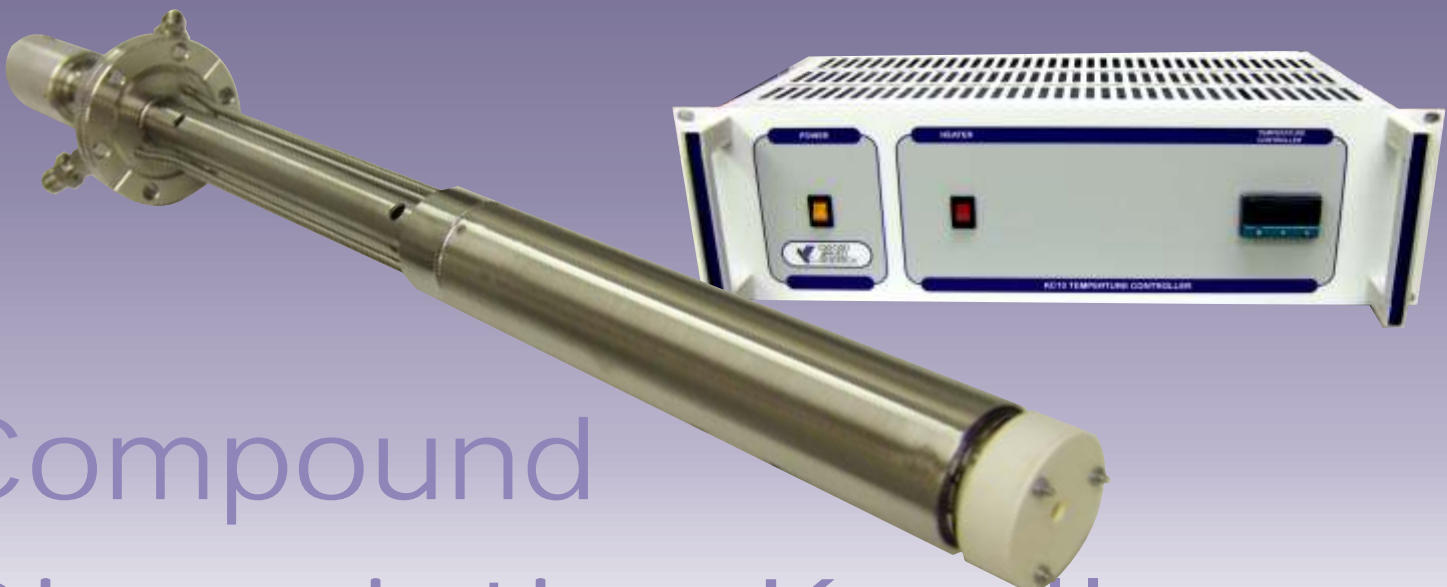
The K-cell is simple to use and maintain and provides stable, reproducible deposition rates. It can be used for applications requiring high growth rates, such as phosphides; or for doping applications.

Applications

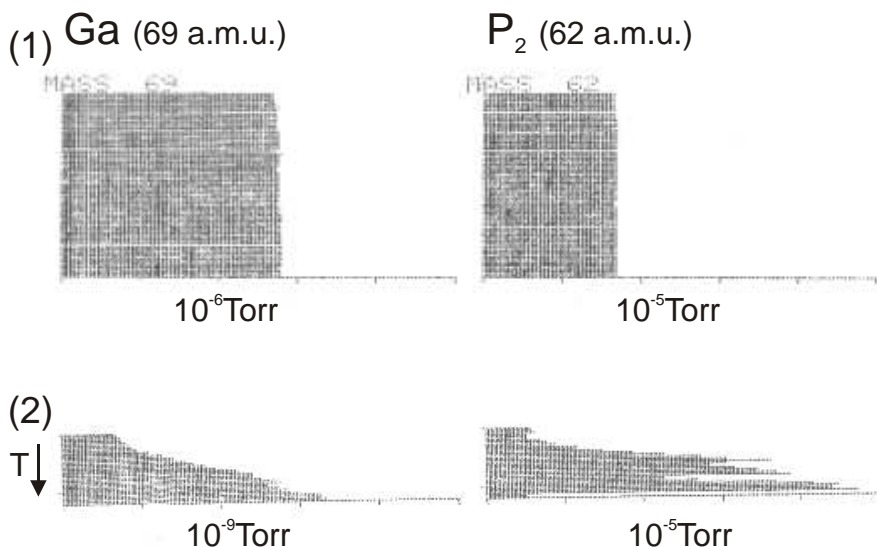
- MBE Growth; GaInP, InP
- P doping in Si MBE
- Arsenides

Features

- Low cost, reliable
- $P_2:P_4 \sim 1000:1$
- $P_2: Ga$ ratio $> 10^4:1$
- Standard K-Cell controllers



Compound
Dissociation K-cell



Thermal dissociation of both GaP and GaAs results in a high ratio of P₂/P₄ and As₂/As₄ respectively. For GaP decomposition the dominance of P₂ over P₄ is ~1000:1 at an optimum dissociation temperature of 950°C. However, there is also a significant (and undesirable) contribution of Ga vapour at this temperature.

Figure 1 shows the partial pressures of Ga and P₂ using the source without the Ga trap. The P₂/Ga ratio is only 6:1. Figure 2 shows the partial pressures of these species with the Ga trap fitted. By this means a P₂/Ga ratio of ~10⁴:1 can be achieved⁽³⁾.

- (1) Farrow, R.F.C., J. Phys D. 7 pp2436 (1974)
 (2) Song, J.D, et al. J.Cryst. Growth 237-239 pp1504 (2002)
 (3) Oxford Applied Research mass spectra (unpublished)

Specifications - CDK35

Mounting flange	NW35CF (70mm / 2.75 inch O.D.)
In-vacuum diameter	34mm
In- vacuum length	200mm (standard)
Operating K-cell temperature	to 1000°C
Crucible	PBN - 35cm ³ *
Power supply	Included
Water cooling	Included
Options	Shutter (NW63CF flange required)

* Higher-capacity models on request

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