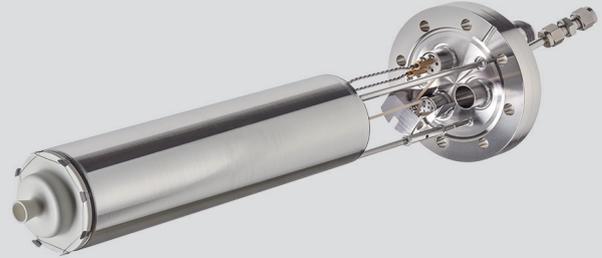
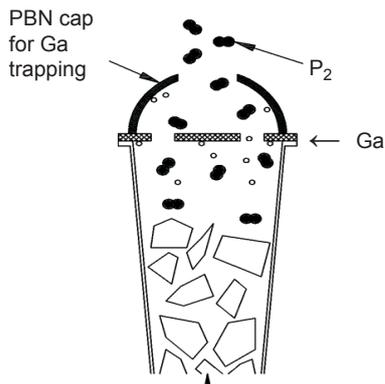


## GAP DECOMPOSITION SOURCE DECO

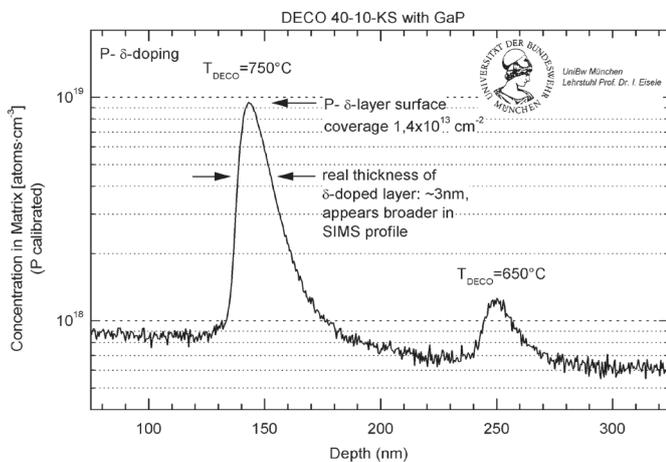
- Compatible to all MBE systems
- Doping and MBE growth applications
- Ultra high purity P<sub>2</sub> beam
- Reduced White Phosphorus deposition
- Simple operation
- High reliability
- Precise and fast flux control



DECO 63-150-60-K on DN63CF (O.D. 4.5") flange



Single crystal GaP purity  
Schematic sketch of the Ga-Trapping-Cap



SIMS measurement of the phosphorus concentration for P-layers deposited at different source temperatures on silicon. Using GaP with a DECO 40-10-22-KS results in sharp doping profiles.

The GaP compound source DECO is an ultra pure source for P<sub>2</sub> based on the decomposition of GaP. At typical operation temperatures of about 900-1000°C GaP is decomposed to Ga, P<sub>2</sub> and P<sub>4</sub>. The P<sub>2</sub> flux is more than two orders of magnitude higher than the P<sub>4</sub> flux. Additional cracking is not necessary and the accumulation of P<sub>4</sub> (White Phosphorus) is reduced to a minimum.

Using an all-PBN Ga-Trapping Cap Unit, the DECO allows the ejection of P<sub>2</sub> molecules from the cell while efficiently trapping parasitic Ga atoms. The very low parasitic Ga flux is more than three orders of magnitude lower than the P<sub>2</sub> flux.

Due to its high operation temperatures, applying the DECO is as easy as using a standard group III effusion cell. Its stable and reproducible flux can be rapidly adjusted.

The construction of the DECO combines our standard effusion cell design with a PBN Ga-Trapping Cap System. Advantages are the easy mounting, compatibility to all MBE systems, high reliability and low cost. Much simplified safety facilities are needed compared to PH<sub>3</sub> sources.

Operation of small capacity DECO sources does not require complicated mechanical valves and controllers. For large capacity requirements we offer valved GaP compound sources VGCS.

The lower image on the left shows a sharp P-doping profile in silicon after the deposition of two P-layers. The experiment was performed at Universität der Bundeswehr, Munich in Prof. Eisele's group.

### Applications

Single crystal GaP material with a purity of >6N is recommended as source material.

For growth applications the DECO is optimized towards high flux operation and maximum crucible charge, which allows long operation time without service or refilling. Typical phosphide compounds like AlGaInP, GaInP, GaAsP or InP can be grown.

For doping applications in SiGe MBE the DECO is optimized towards lower temperature operation. Small crucible charges, large double layer shutters, integrated water cooling and reduced shielding allow a fast shutdown of the cell after each doping step. Sharp P-doping profiles have been reported.

Due to its small dimensions and easy operation the DECO is ideally suited for applications in surface science and small sample preparation

### Technical Data

Mounting flange	DN40CF (O.D. 2.75"), DN63CF (O.D. 4.5") or larger
Dimensions in vacuum	L= 216-400 mm, D=22-60 mm
Filament type	Ta wire heating filament, optimized for growth or doping applications
Thermocouple	W5%Re/W26%Re (type C)
Bakeout temperature	max. 250°C
Outgassing temperature	1500°C
Operating temperature	500-800°C for doping sources 900-1200°C for growth sources
Cooling	integrated water cooling (K) or separate cooling shroud (CS)
Crucibles	10-420 cm <sup>3</sup> ; PBN
Options	integrated shutter (S); source optimization for growth (DECO) or doping application (DECO-D)

