

technical bulletin

New Liquid Carbon Dopant Source (CBr₄Cl₃)

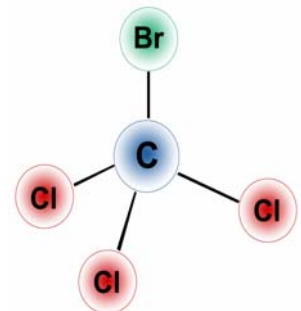
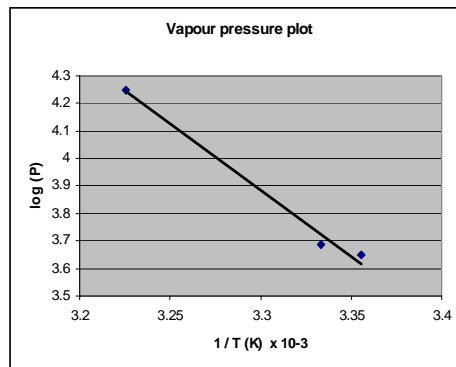
With the listing of carbon tetrachloride (CCl₄) in the Montreal treaty, its use is severely limited and alternative carbon dopants have been sought. The bromide derivative CBr₄ is a solid and therefore suffers from the channeling and pick up variations associated with this type of source. Also, it possesses a relatively low volatility. To overcome such performance problems, SAFC Hitech developed Solution CBr₄™ making use of patented technology by suspending the solid source in a high boiling hydrocarbon. However, despite very good results in growth processes with high C levels achieved (>10²⁰ cm⁻³), this source is not perceived as an ideal material and a true liquid source with higher vapor pressure is suggested to offer higher potential.

The new source Bromotrichloromethane (CBrCl₃) has been investigated as a dopant source offering improvements on both the two compounds mentioned above. This novel dopant possesses increased volatility compared to CBr₄ and is a liquid under usual operating conditions. Furthermore, it avoids the problem of severe insitu etching observed with CCl₄. Finally, it is not formally listed as being environmentally unfriendly [1] and so its use is not restricted.

Literature reports have highlighted its suitability for use in MOVPE [2,3] with 10¹⁹ - 10²⁰ cm⁻³ doping levels detailed and this new product is now available from SAFC Hitech in research quantities to high purity for evaluation.

Physical Characteristics

MW	198.27	Liquid Density	2.012
MP	-6°C	Vapor Density	6.85
BP	105°C	Cp Liquid (298)K	149.4
VP	38.4mmHg@ 25°C	VP 40mmHg @ 27°C	
VP	70mmHg@ 37°C		



References

- [1] CAS Number 75-62-7, EEC Number 200-886-0
- [2] Heavy carbon doping of GaAs by MOVPE using a new dopant source CBrCl₃ and characterization of the epilayers. K Uchida et al, ICMOVPE XI, Berlin, June 2002
- [3] MOVPE growth of heavily carbon-doped GaAs using a new dopant source of CCl₃Br and quantitative analysis of compensation mechanism in the epilayers S Bhunia et al, ICMOVPE XI, Berlin, June 2002