

Assistant species	Weakest Bond	TICS (Å ²)	Ionization Energy (eV)	Weakest BDE/IE
CF ₄	C-F	5.6	16.2	0.33
CH ₄	C-H	3.5	12.6	0.35
CH ₃ F	C-H	4.4	13.1	0.34
CH ₂ F ₂	C-H	-	13.3	0.33
CHF ₃	C-H	6.1	14.8	0.31
CH ₃ Cl	C-Cl	7.5	11.3	0.31
CH ₂ Cl ₂	C-Cl	-	11.3	0.28
CHCl ₃	C-Cl	12.3	11.4	0.28
CH ₂ ClF	C-Cl	7.2	11.7	0.27
CHF ₂ Cl	C-Cl	7.7	12.3	0.26
CHFC1 ₂	C-Cl	10.7	12.4	0.26
CH ₃ Br	C-Br	8.5	10.5	0.28
CH ₂ Br ₂	C-Br	11.7	10.5	0.25
CHBr ₃	C-Br	-	10.7	0.22
CH ₃ CN	C-H	6.3	12.4	0.28
CF ₃ CN	C-F	6.3	14.0	0.39
HCN	C-H	-	13.7	0.41
CClF ₃	C-Cl	8.1	13.1	0.27
CCl ₂ F ₂	C-Cl	11.0	11.7	0.28
CCl ₃ F	C-Cl	13.2	11.7	0.27
CCl ₄	C-Cl	16.0	11.5	0.26
CS ₂	C-S	8.0	10.0	0.41
Si ₂ H ₆	Si-H	8.1	9.9	0.31
GeH ₄	Ge-H	5.3	10.5	0.32
SiH ₄	Si-H	5.2	11.2	0.28
Ge ₂ H ₆	Ge-Ge	7.6	12.5	0.23
C ₂ H ₆	C-C	6.4	11.6	0.33
B ₂ H ₆	B-H	11.0	11.4	0.30
CH ₂ CF ₄	C-C	-	13.3	0.35
CH ₃ CF ₃	C-C	-	13.3	0.33
CH ₃ NH ₂	C-N	-	9.5	0.36

Table 1: Select assistant species and their properties

Dopant Source	GeF ₄	BF ₃	SiF ₄	CO
Target Ionic Species	Ge	B, BF ₂	Si	C
Assistant Species General Formulas	CH _i F _j Cl _y Br _z I _q C _i H _j N _y X _z Si _q H _y X _z	CH _i F _j Cl _y Br _z I _q C _i H _j N _y X _z Si _q H _y X _z	CH _i F _j Cl _y Br _z I _q C _i H _j N _y X _z	Si _q H _y X _z
Assistant Species Specific				
CS ₂	X	X	X	
C ₂ H ₆	X	X	X	
CH ₃ F	X	X	X	
CH ₃ CN	X	X	X	
CH ₂ ClF	X	X	X	
CH ₃ Cl	X	X	X	
CF ₄	X	X	X	
CH ₄	X	X	X	
CH ₂ F ₂	X	X	X	
CHF ₃	X	X	X	
CH ₂ Cl ₂	X	X	X	
CHCl ₃	X	X	X	
CHF ₂ Cl	X	X	X	
CHFCI ₂	X	X	X	
CH ₃ Br	X	X	X	
CH ₂ Br ₂	X	X	X	
CHBr ₃	X	X	X	
CF ₃ CN	X	X	X	
HCN	X	X	X	
CCIF ₃	X	X	X	
CCl ₂ F ₂	X	X	X	
CCl ₃ F	X	X	X	
CCl ₄	X	X	X	
CH ₂ CF ₄	X	X	X	
CH ₃ CF ₃	X	X	X	
CH ₃ NH ₂	X	X	X	
SiH ₄	X	X		X
Si ₂ H ₆	X	X		X
SiH ₃ Cl	X	X		X
SiH ₂ Cl ₂	X	X		X
Ge ₂ H ₆		X	X	X
GeH ₄		X	X	X
B ₂ H ₆	X		X	X

Table 2: Dopant sources and target ionic species paired with suitable assistant species

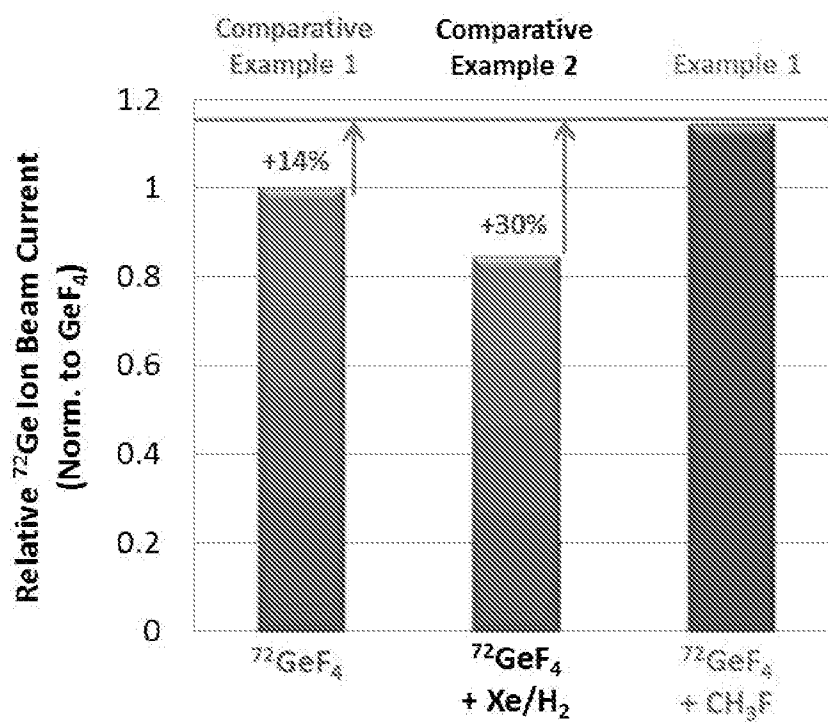


Figure 1: Relative ^{72}Ge ion beam current data for $^{72}\text{GeF}_4$ gas mixtures

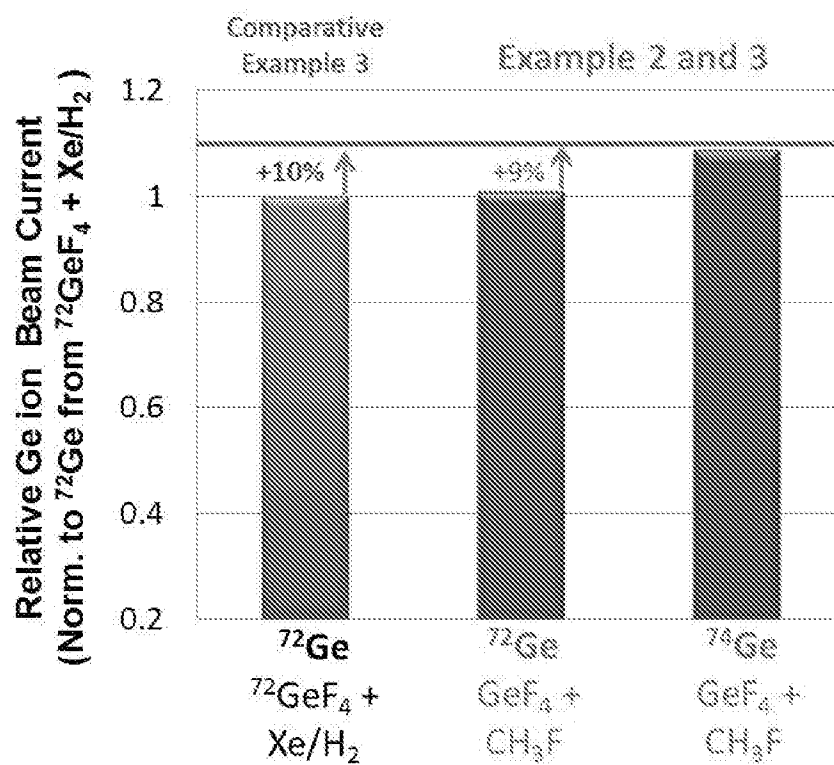


Figure 2: Relative Ge ion beam current produced from naturally occurring GeF_4 and isotopically enriched $^{72}\text{GeF}_4$ gas mixtures

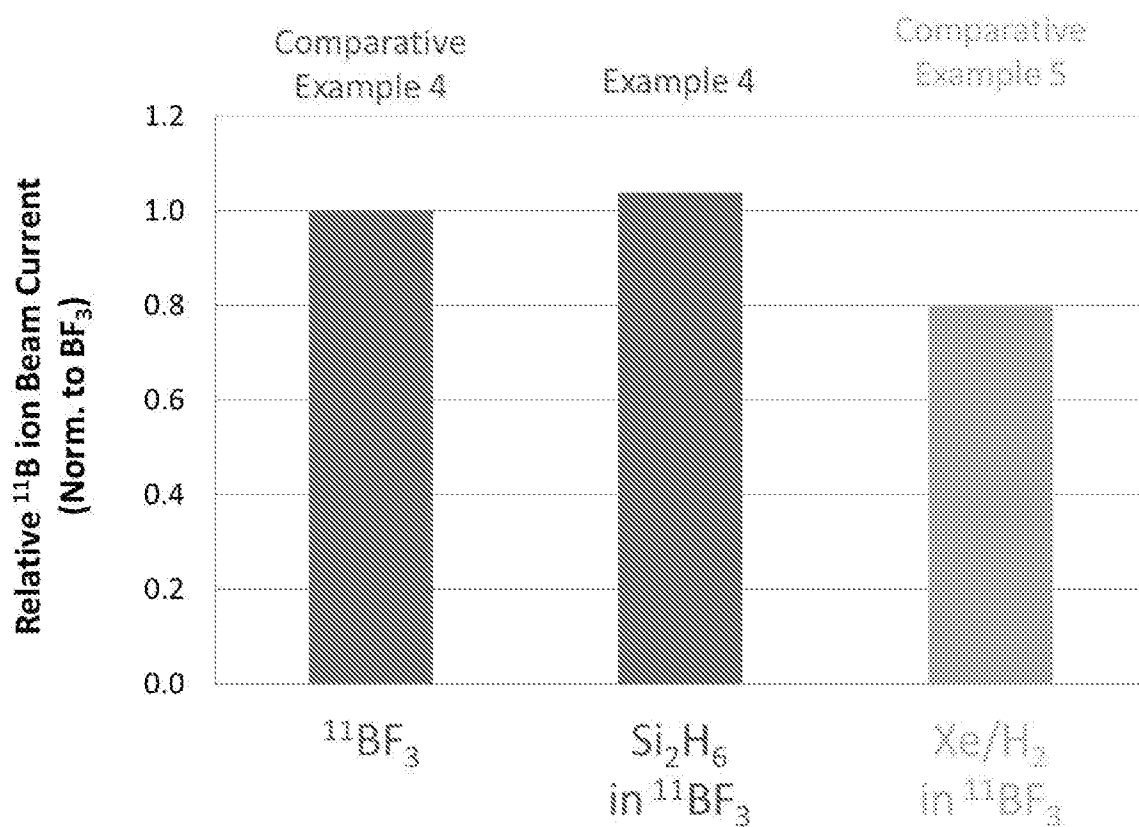


Figure 3 – Relative beam current of ^{11}B ions generated from gas mixtures of isotopically enriched $^{11}\text{BF}_3$