(a) [Te] = 1.7×10^18 cm^-3

- 50nm GaAs:Si (T_{sub} = 420°C)
- 500nm GaInP:Te (T_{sub} = 420°C) — 0.05 ML
- 200nm GaAs:Si (T_{sub} = 630°C)
- 500nm GaInP:Te (T_{sub} = 460°C) — 0.05 ML

Growth direction

(b) [Te] = 5.7×10^17 cm^-3

- 50nm GaAs:Te (T_{sub} = 420°C)
- 400nm GaInP:Te (T_{sub} = 420°C) — 0.017 ML
- 400nm UID GaInP (T_{sub} = 420°C)
- 400nm GaInP:Te (T_{sub} = 420°C) — 0.0034 ML
- 400nm UID GaInP (T_{sub} = 420°C)
- 400nm GaInP:Te (T_{sub} = 420°C)
- 400nm UID GaInP (T_{sub} = 420°C)
- 400nm GaInP:Te (T_{sub} = 460°C)

Figure 1: Growth structures for GaInP:Te SIMS profiling, grown on GaAs (001) substrates (not shown). Te pre-dose values indicated by dotted lines in monolayers (ML). (a) target [Te] = 1.7×10^18 cm^-3 with GaAs spacer to absorb excess Te. (b) target [Te] = 5.7×10^17 cm^-3 with unintentionally doped (UID) GaInP spacers to absorb excess Te.

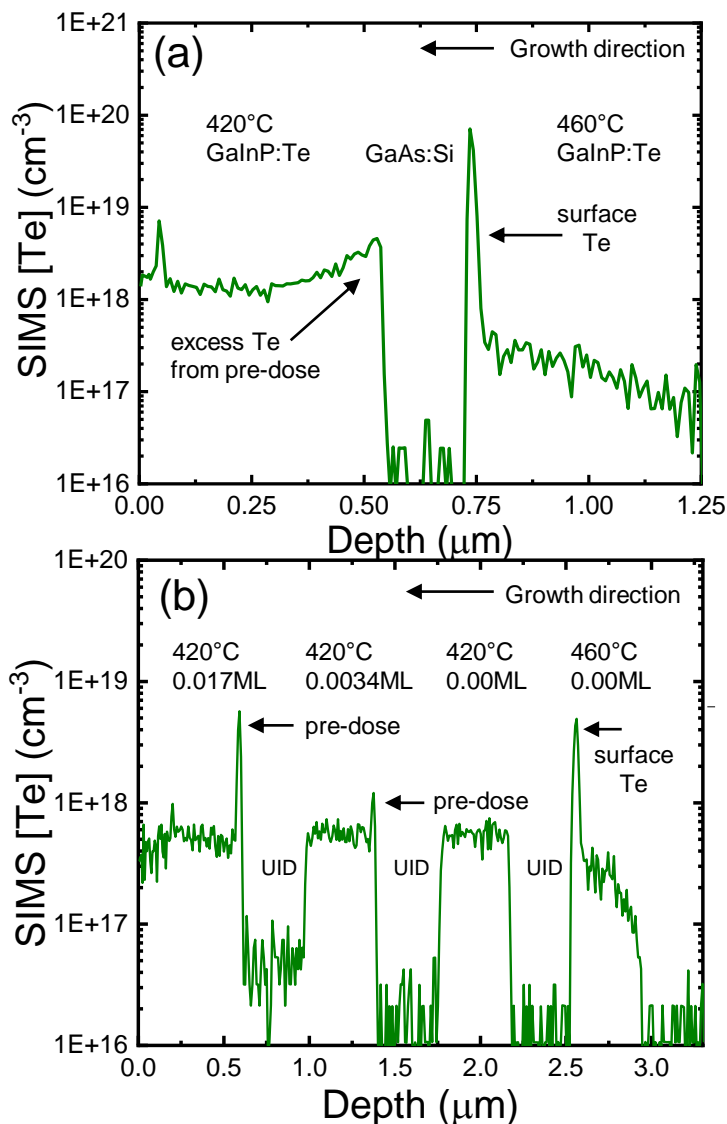Figure 2: SIMS profiles corresponding to growth structures in Figure 1. (a) SIMS for target [Te] = 1.7×10^18 cm^-3 shows greatly reduced but visible segregation at T_{sub} = 420 °C. (b) SIMS for [Te] = 5.7×10^17 cm^-3 shows complete suppression of surface segregation at T_{sub} = 420 °C, as seen by abrupt Te pre-dose spikes.
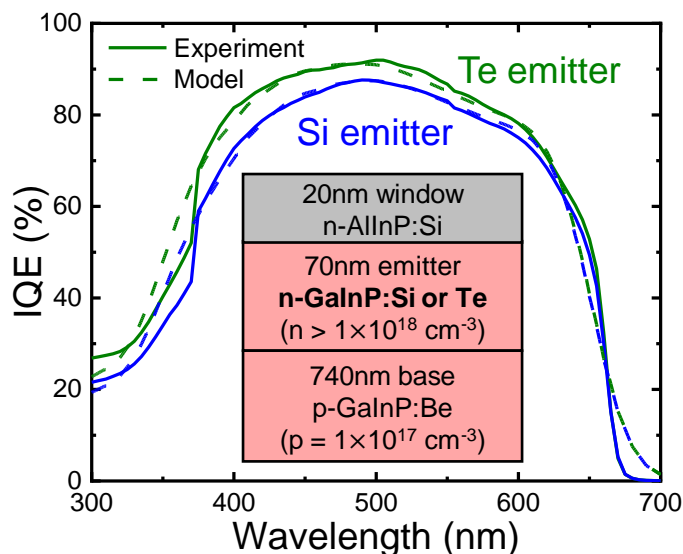

Figure 3: IQE of GaInP solar cells with GaInP:Si and GaInP:Te emitters, experimental (solid) and modeled (dotted). The model indicates a ~4× improved carrier lifetime for n-GaInP:Te. Inset simplified cell structure shows AlInP window and n/p GaInP absorber region.

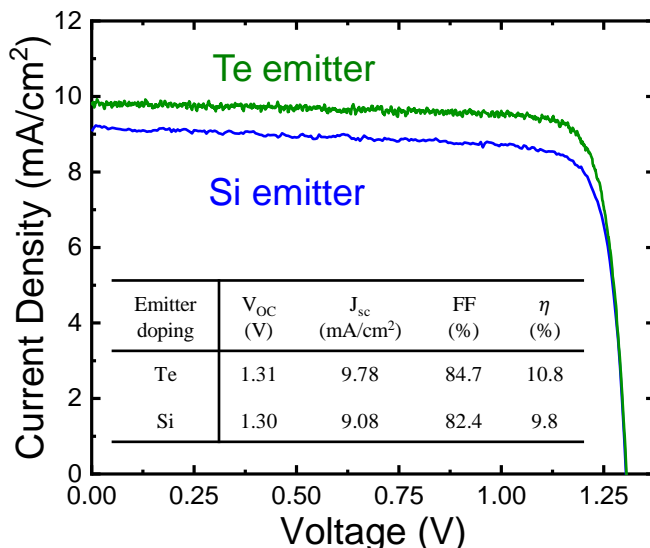| Emitter doping	V_{OC} (V)	J_{sc} (mA/cm^2)	FF (%)	η (%)
Te	1.31	9.78	84.7	10.8
Si	1.30	9.08	82.4	9.8

Figure 4: Lighted IV curves of GaInP cells with GaInP:Si and GaInP:Te emitters, and figures of merit of open-circuit voltage (V_{OC}), short-circuit current density (J_{sc}), fill factor (FF), and efficiency (η).

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