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# Numerical simulations of novel SiGe-based IBC-HJ solar cell for standalone and mechanically stacked tandem applications

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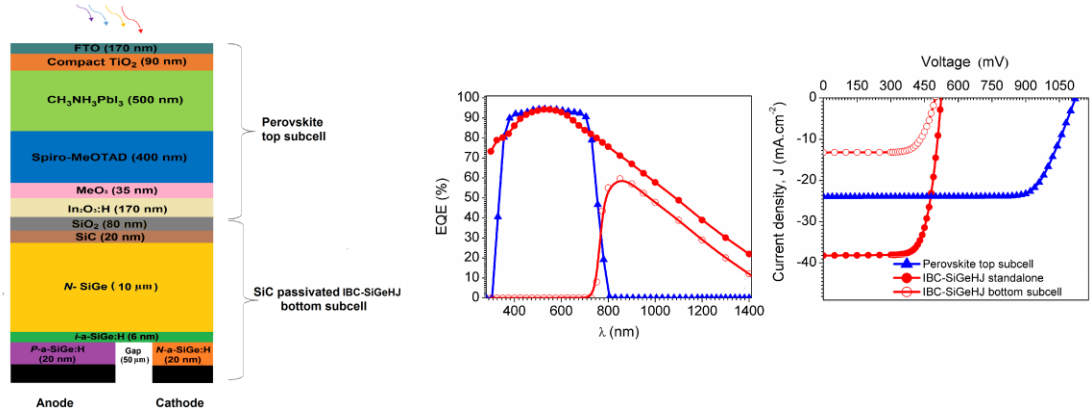
Graphical abstract




## Highlights

- Innovative $Si_{0.75}Ge_{0.25}$ based IBC-HJ solar cell been proposed and simulated.
- Optimization has been done for 10 μm thick IBC-SiGeHJ.
- 15.4% PCE has been simulated under standalone operating condition
- In combination with perovskite top subcell, we further demonstrate 25.7% PCE.
- Results shows, proposed design, can be a good candidate to obtained ultra-high efficiencies.

**Abstract-** In this study, a novel 10 microns thick interdigitated back contact silicon-germanium heterojunction (IBC-$Si_{1-x}Ge_x$HJ) solar cell device has been designed and simulated for standalone and four-terminal mechanically stacked tandem applications. Optimization of i-a-SiGe: H thickness, the width of n-a-SiGe: H region, p-a-SiGe: H region and gap along with composition fraction ($x$) lead to 15.5% power conversion