

INCEPT / 2013

InGaN-based High Efficiency Concentrated Photovoltaic

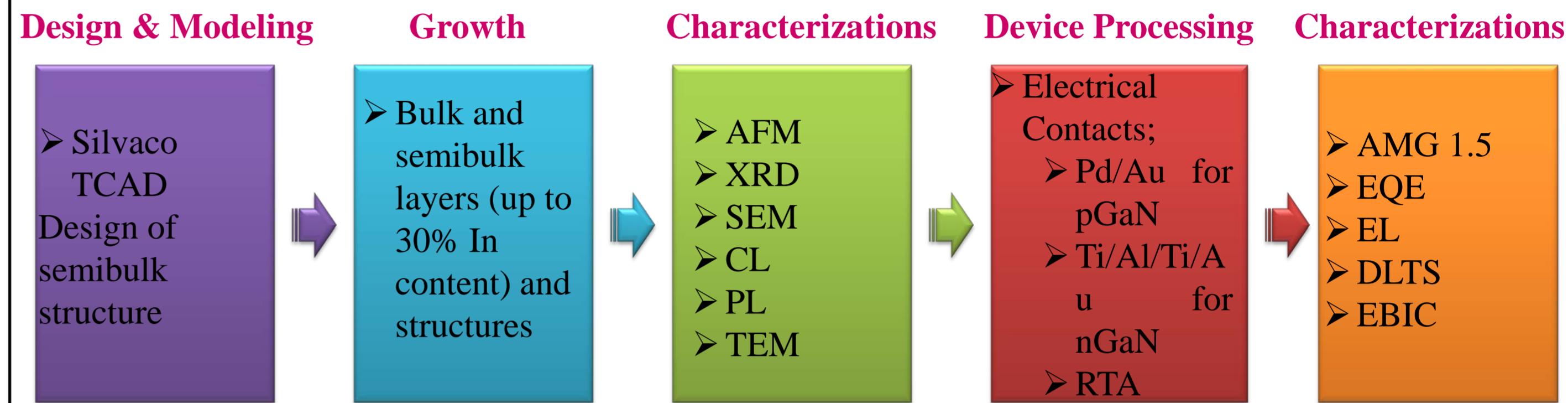
AAP exploratoires dans le domaine de l'énergie

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Objectifs

InGaN multi-junction devices are predicted to be able to achieve an efficiency of more than 50%. However, for indium In content larger than 10%, thick InGaN epitaxial films tend to exhibit phase separation and strain relaxation both detrimental for solar cells. The main objective is, using a novel approach for the growth of the InGaN layers, the demonstration of efficient InGaN-based solar cells with indium content up to 30%

Plan de travail et méthodes

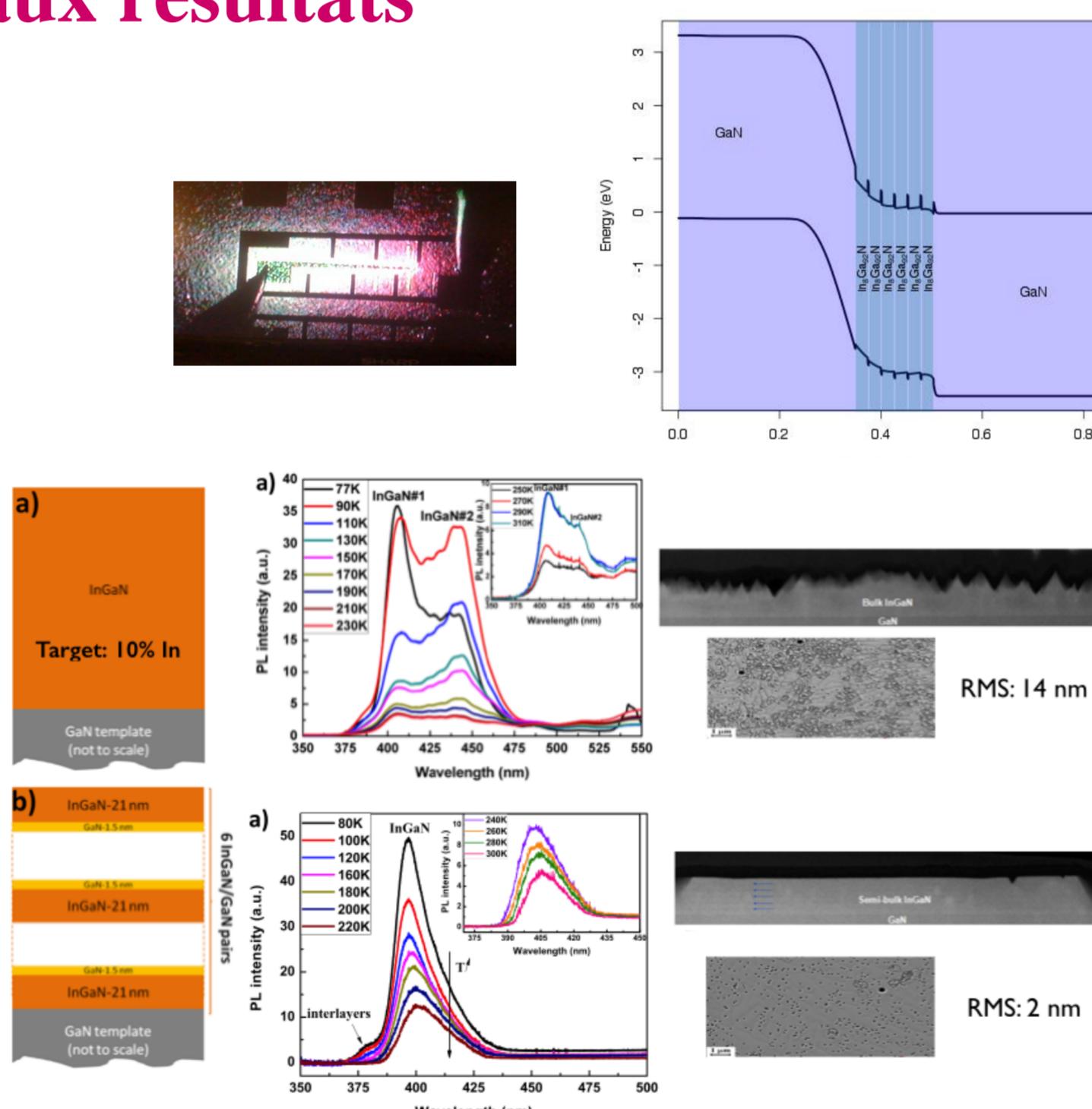


Principaux résultats

Growth of
- InGaN layers on GaN template substrates. Both bulk and semibulk approaches were used : high structural quality, 2D, fully strained, 10 nm thick and up to 37% In content.

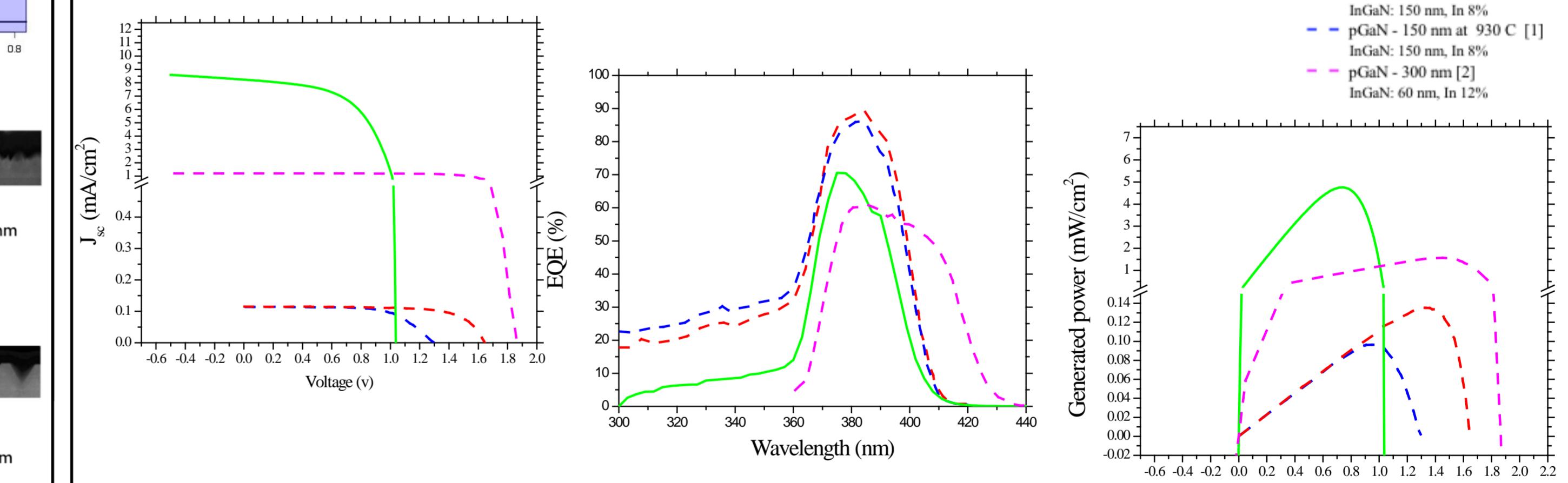
- 300 nm thick p-GaN layers with hole concentration up to $3 \times 10^{17} \text{ cm}^{-3}$, mobility of $1 \text{ cm}^2 \text{V}^{-1} \text{s}^{-1}$, and resistivity of $12 \Omega \text{cm}$ and specific contact resistance on the order of $10^{-3} \Omega \text{cm}^2$.

- full PIN structures, with up to 12% In content and 144nm thick InGaN absorber, on GaN templates.



Conclusion/Résumé des faits marquants

- Efficiency of more than one order of magnitude larger than the state of the art has been reached ($V_{oc} = 1.3 \text{ V}$, $J_{sc} = 8 \text{ mA/cm}^2$, FF = 47%, EQE = 75%).
- 4 journal papers ; 3 invited talk ; 1 conference proceeding



Prolongement/perspectives

Une pré-proposition a été déposée à l'ANR : Projet PHOENIX (cellules PV tandem III-N/III-V)