

Self-assembled Ni_{0.98}Li_{0.02}O and Zn_{0.98}Al_{0.02}O composite interface for thermoelectrics

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1. Introduction

Device/Module ZT

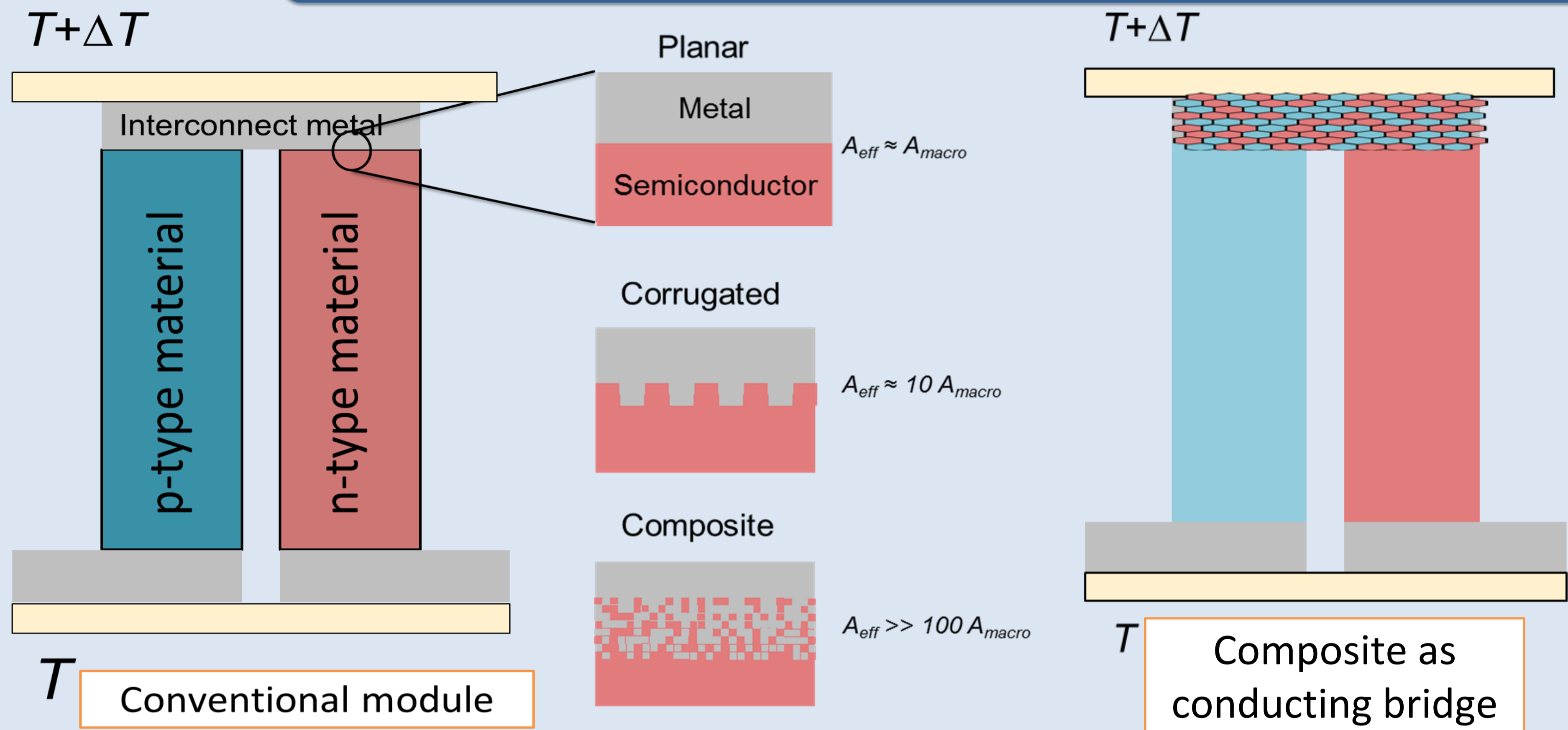
$$Z_{Device}T = \frac{S_{Device}^2}{\kappa_{Device} R_{Device}} T$$

$$S_{Device} = S_p - S_n$$

$$\kappa_{Device} = \frac{A_n}{L} \kappa_n + \frac{A_p}{L} \kappa_p + \frac{A}{\kappa_{contact}}$$

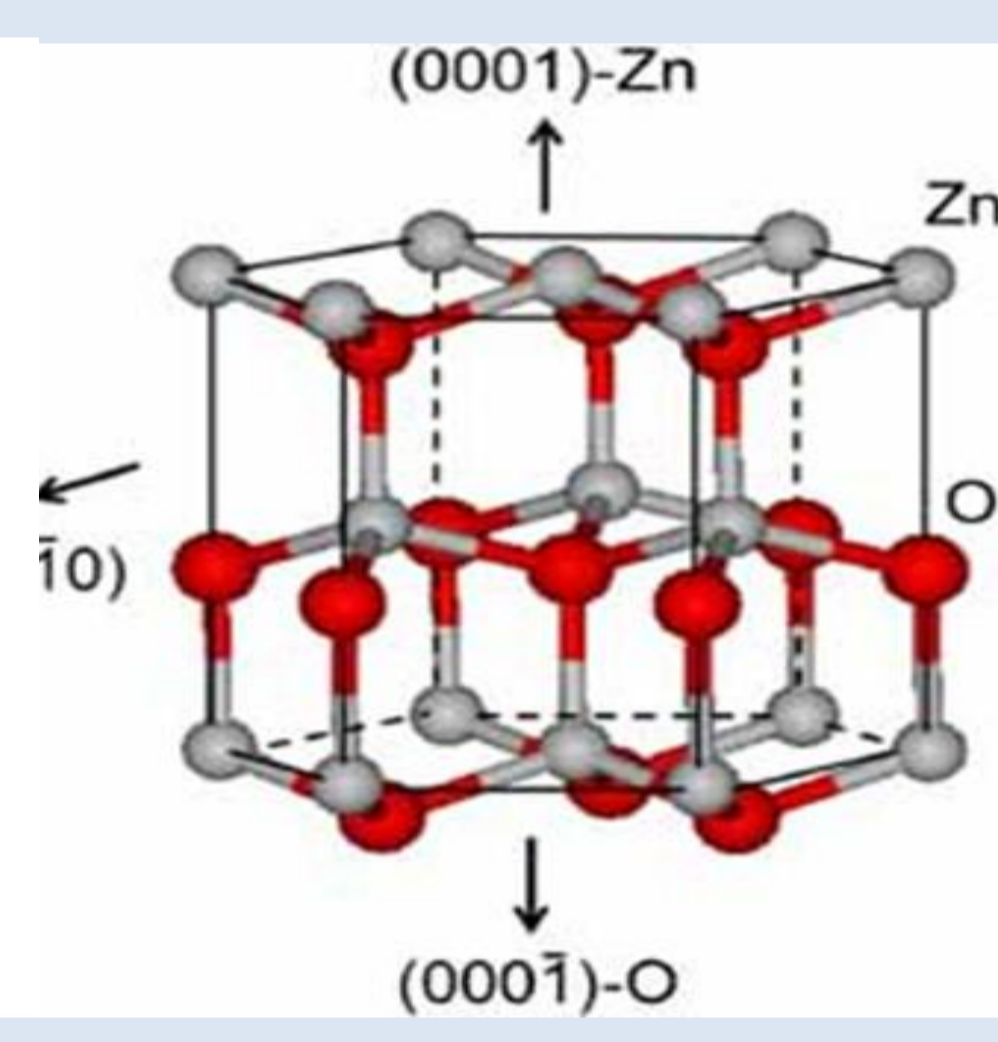
$$R_{Device} = R_{legs} + R_{contact} + R_{interconnect}$$

Thermoelectric module interface engineering

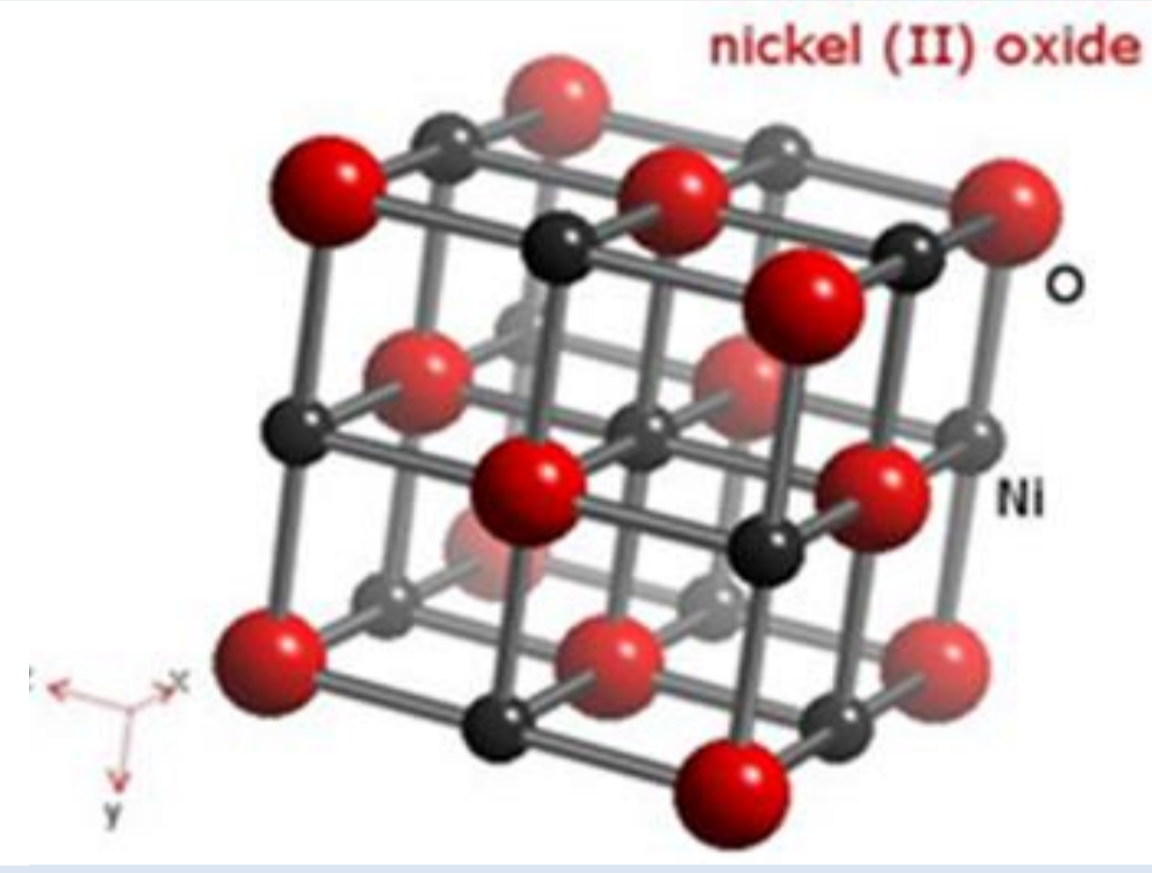


2. Li-NiO and Al-ZnO System

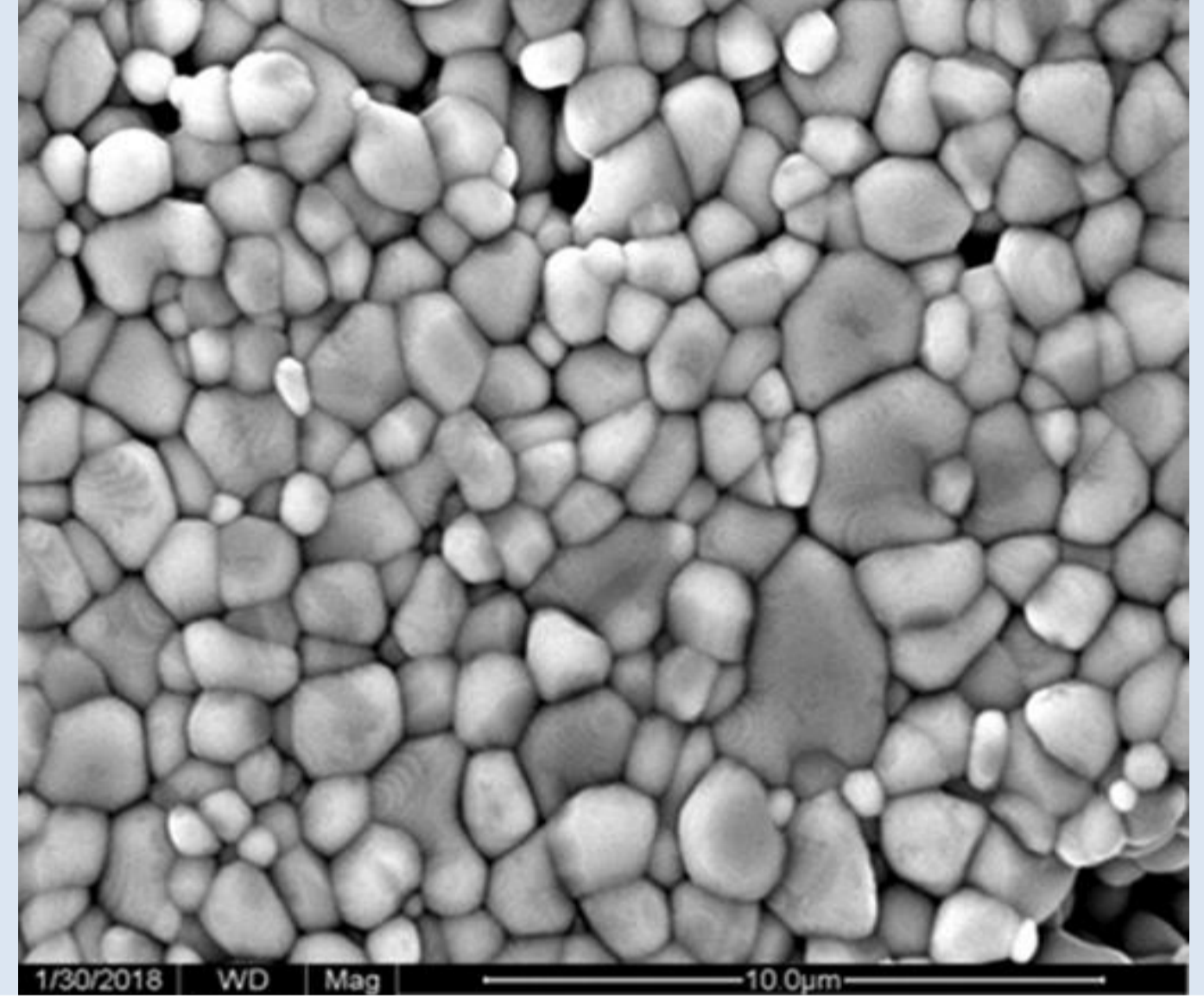
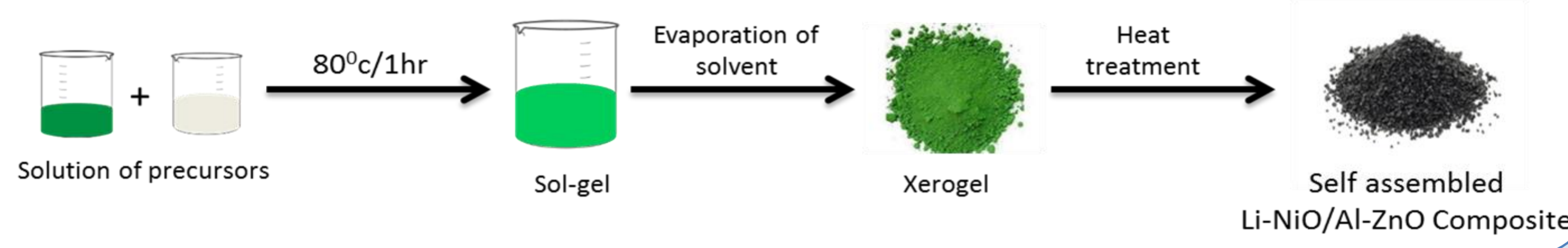
- ZnO
 - Zn_{1-x}O_{1-y}
 - Cation interstitials,
 - Oxygen vacancies
 - Electrons; n-type
 - Al-doping



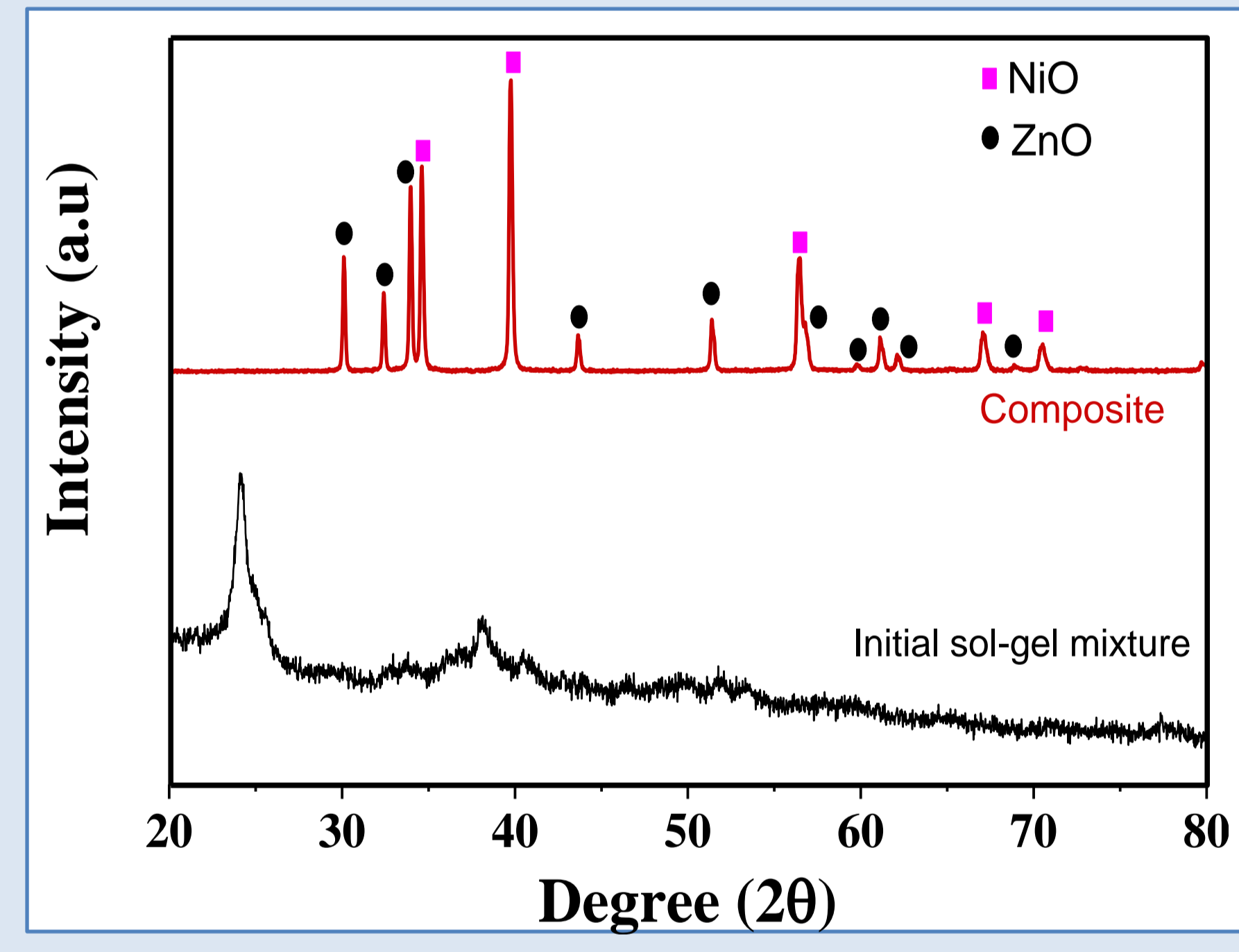
- NiO
 - Ni_{1-x}O
 - Cation vacancies
 - Electron holes; p-type
 - Li-doping



Sol-gel Reaction

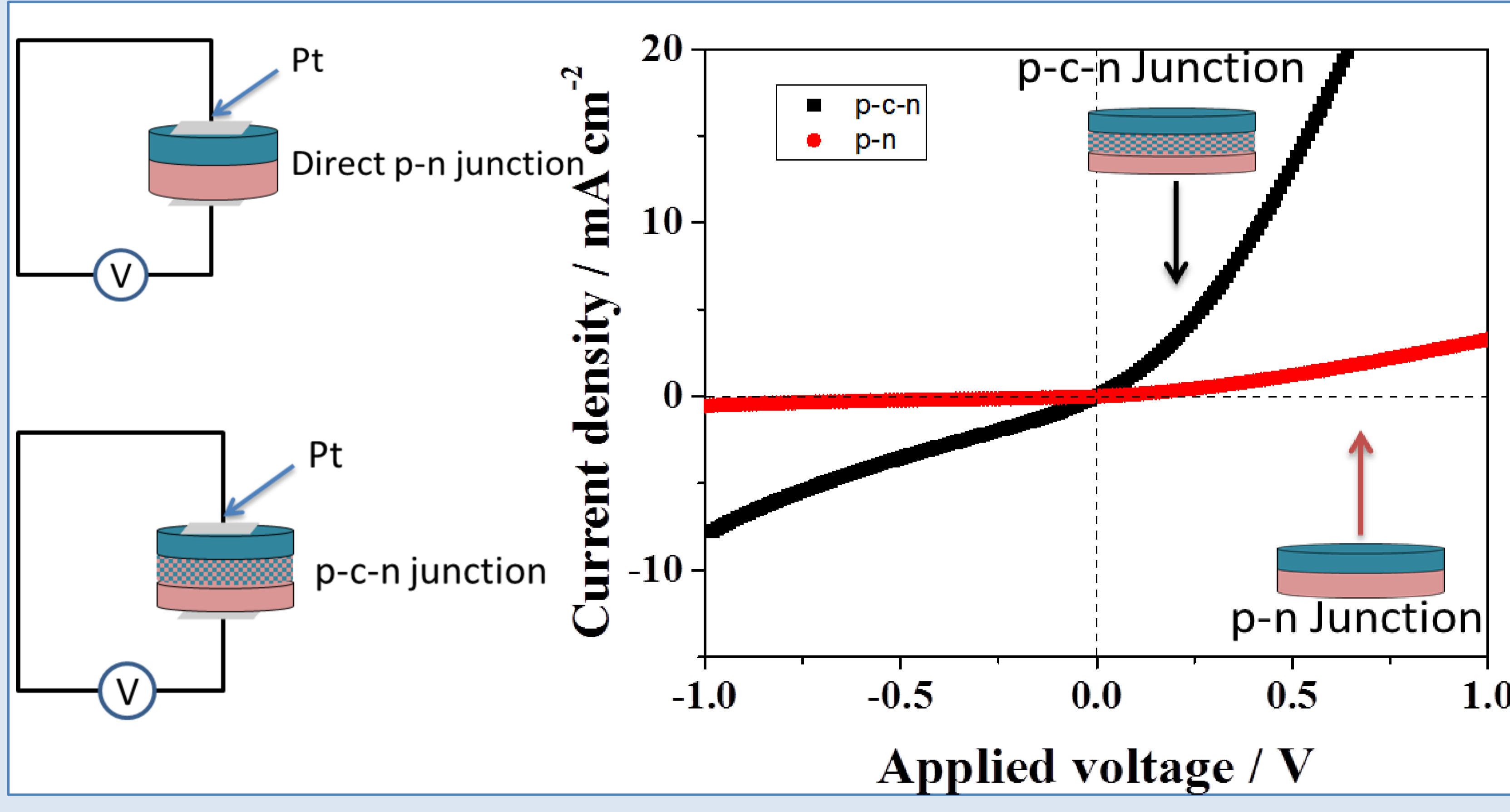
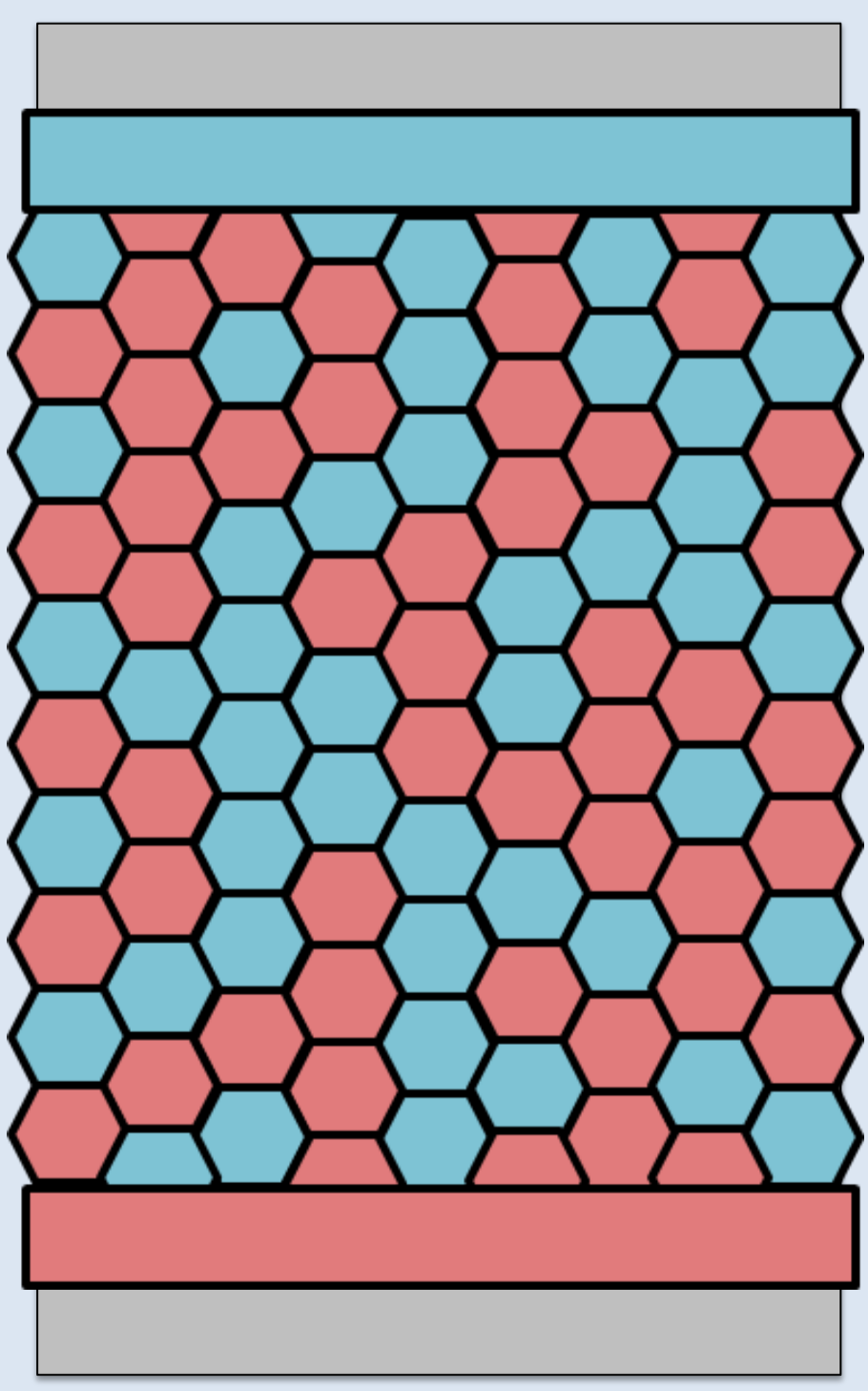


SEM image of the composite after sintering at 1000°C



3. Li-NiO/Al-ZnO Composite interfaces

Current runs through NiO and then through the interface and then through the ZnO.



4. Conclusions

- Fine microstructures of Li-NiO/Al-ZnO composite.
- Sharp and highly stable equilibrated interfaces.
- Increased effective area- minimize the contact resistance.
- Less rectifying p-c-n junction than direct p-n junction.