

次世代半導体ナノ構造太陽電池 (Next-Generation Solar Cells using Semiconductor Nanostructures)



Key words: Silicon, Nanostructures, Solar cells

Research Backgrounds & Purpose

Siナノ構造体を機能的に複合化し、Si材料の削減による低コスト化および変換効率向上を両立した、これまでに無い新しい次世代高効率太陽電池材料の開発

Development of next-generation solar cells using functionalizing Si nanostructures to realize both low-cost and high efficiency

Current Issue

次世代高効率Siナノ構造太陽電池の重要な材料となるSiナノ結晶およびSiナノワイヤの成長制御技術を確立

Establishment of fabrication methods of Si nanocrystals and Si nanowires for the realization of next-generation high efficiency solar cells

Siナノ構造の創製 Synthesis of Si nanostructures

1. 溶液分散Siナノ結晶の作製と太陽電池応用 - Fabrication of Si nanocrystals dissolved in solution and their application to solar cells.

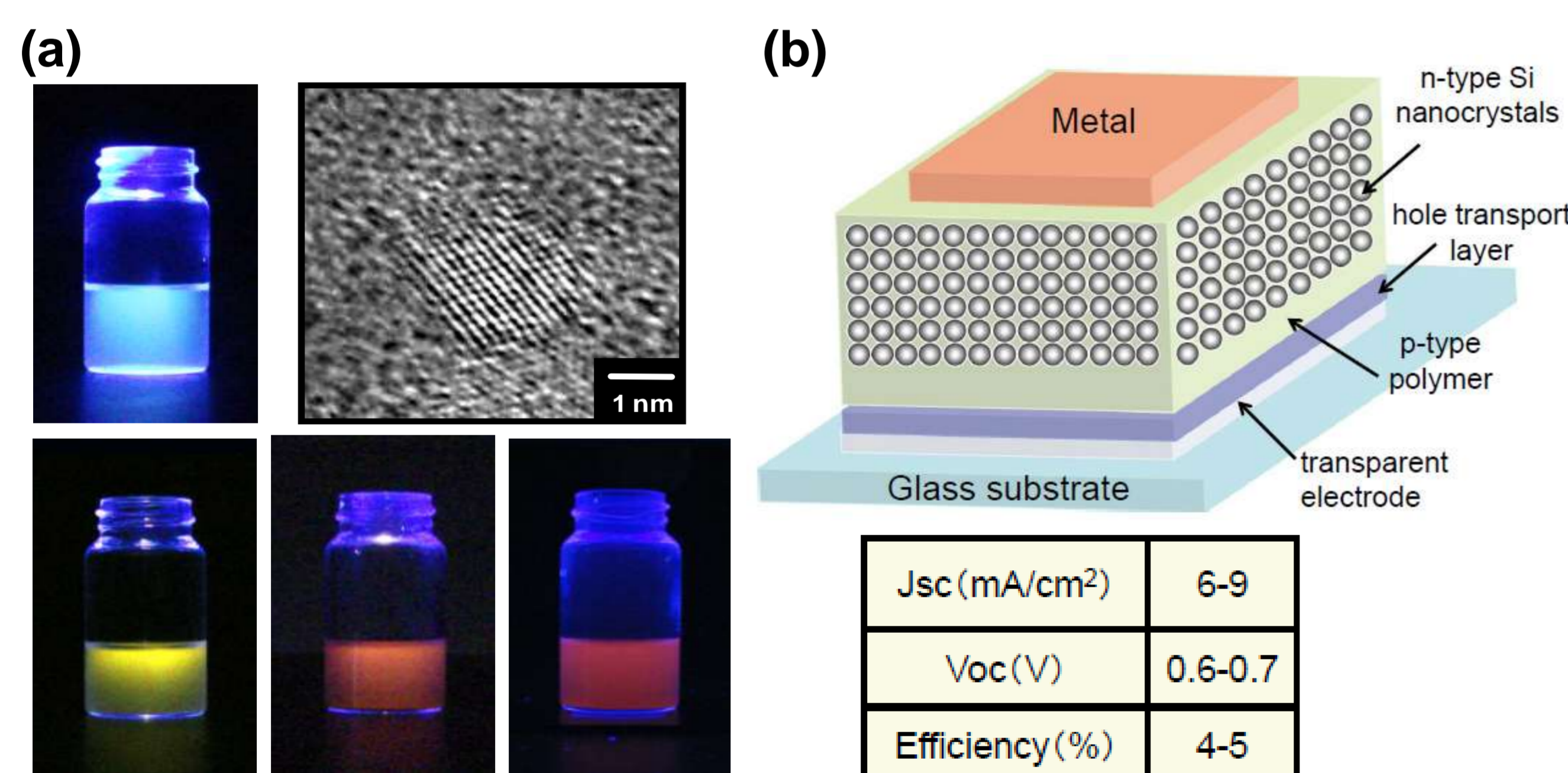


Fig.1. (a) Si nanocrystals dissolved in solution and a representative TEM image of Si nanocrystals. (b) A schematic illustration of solar cell using Si nanocrystals and the solar cell property.

2. Siナノワイヤノ成長制御 - Growth control of Si wires.

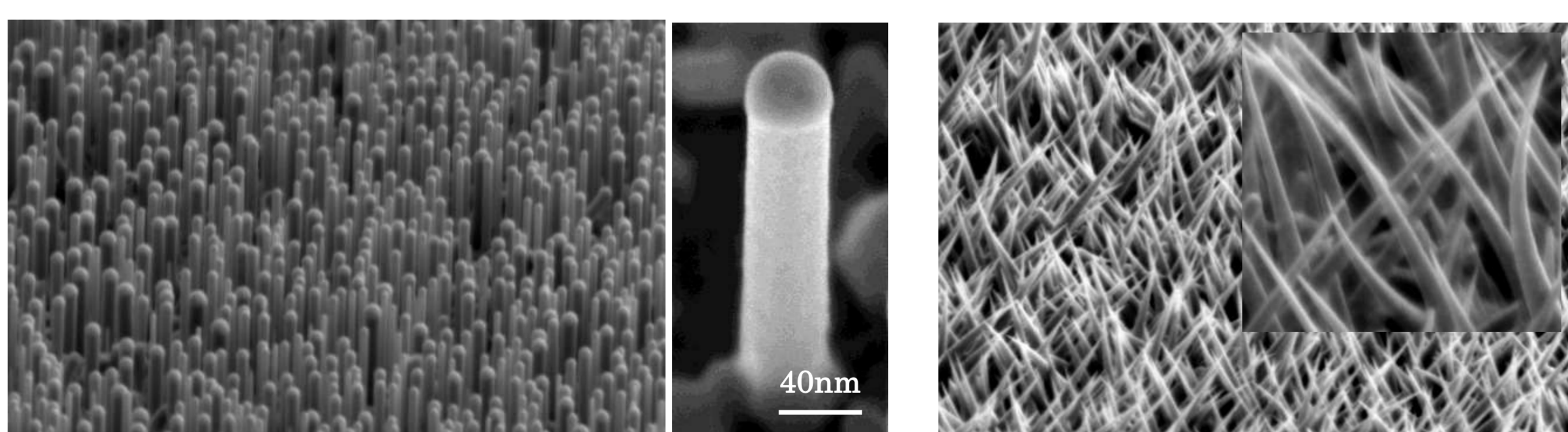


Fig. 2. SEM and STEM images of Si nanowires.

Siナノ構造太陽電池 Si nanostructural solar cell

3. Siナノ構造太陽電池の概念図と試作例 - Concept of Si nanostructure solar cells and the example.

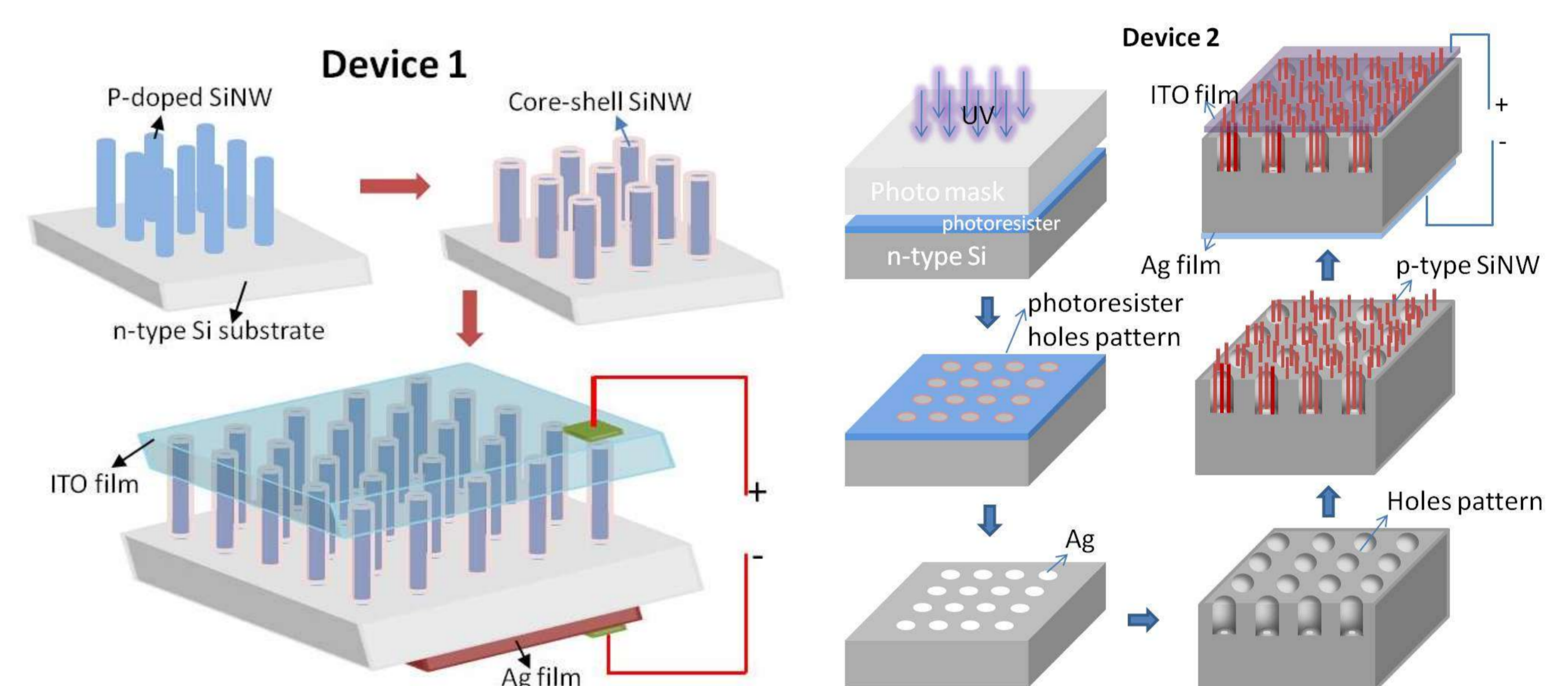


Fig.3. Concepts of Si nanostructural solar cells.

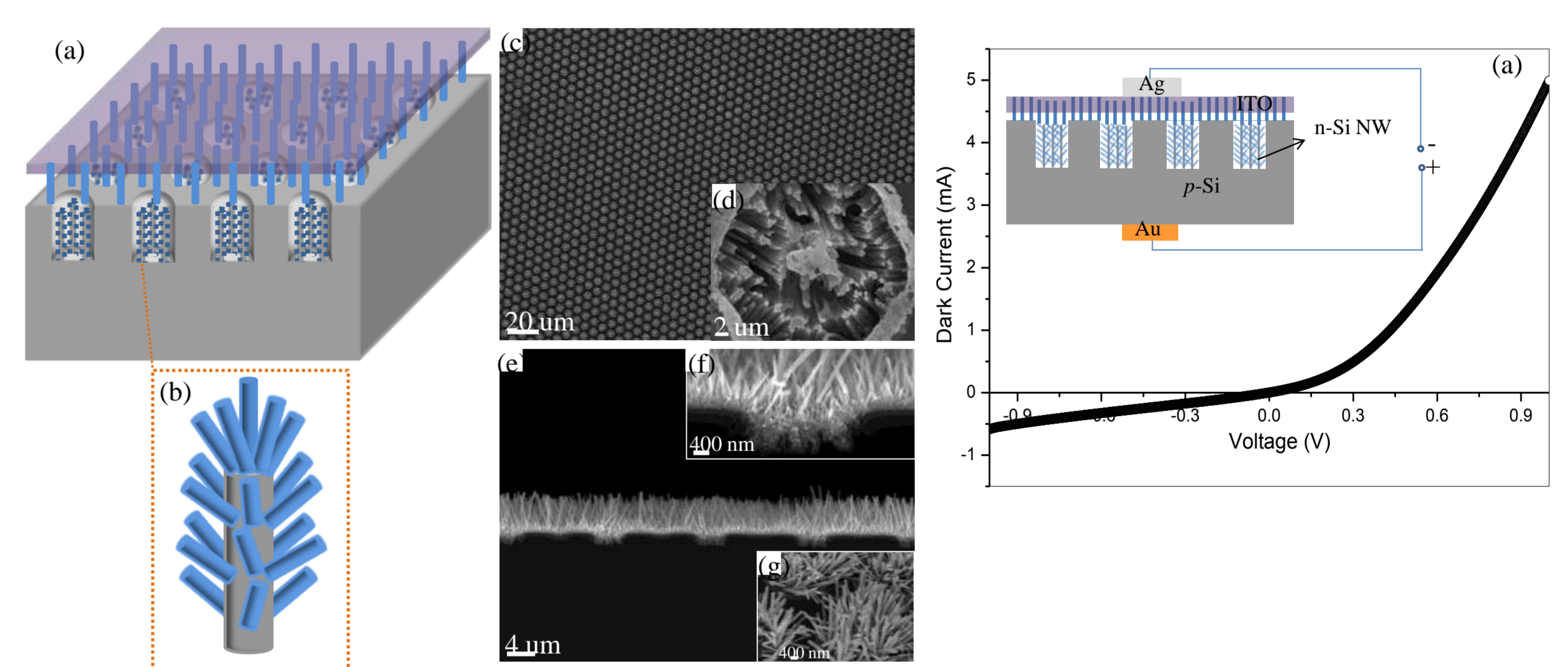


図4. An example of hetero-structure solar cells using Si nanowires and ZnO nanostructures .

Summary

- Siナノ構造の生成法および不純物ドーピング法の確立
ナノ構造体中のpn制御を可能にする！
- Siナノ構造を利用した新規太陽電池セルの試作

Establishment of synthesis of Si nanostructures and doping methods.

Demonstration of Si nanostructural solar cells

Research Outcome or future development

- 機能化によるSi太陽電池の理論最大変換効率の打破
- グリーンイノベーション推進によるクリーン社会の実現

Overcome the theoretical limitation of efficiency of Si solar cell using functionalized Si nanostructures

Realization of clean society promoting green innovation

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