Unit 8 - Week 7 : Second Generation Solar Cells

Course outline

How does an NPTEL online course work?

Week 1 : Introduction and Solar radiation fundamentals

Week 2 : Basic physics of semiconductors

Week 3 : Carrier transport, generation and recombination in semiconductors

Week 4 : Semiconductor junctions

Week 5 : Essential characteristics of solar photovoltaic devices

Week 6 : First Generation Solar Cells

Week 7 : Second Generation Solar Cells

- Lecture 31 : Manufacturing of Si
- Lecture 32 : Generation I Technologies: GaAs Solar Cells
- Lecture 33 : Generation II Technologies : CdTe Solar Cells
- Lecture 34 : Generation II Technologies : CdTe Solar Cells
- Lecture 35 : Generation II Technologies: CdTe Solar Cells
- Quiz : Assignment 7
- Solar Photovoltaics: Principles, Technologies and Materials: Week 7 Feedback
- Assignment 7 Solution

Week 8 : Third Generation Solar Cells

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Assignment 7

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2020-03-19, 23:59 IST.

1) Which of the following processes is/are used for manufacturing single crystal Si from semiconductor grade Si? *1 point*

- [ ] Float zone method
- [ ] Ethyl corporation process
- [ ] Czochralski process
- [ ] Fluid bed reactor process

No, the answer is incorrect.
Score: 0
Accepted Answers:
Float zone method
Czochralski process

2) $POCl_3$ treatment in Si solar cell is done to achieve: *1 point*

- ( ) improved surface texturing
- ( ) p-type doping of emitter
- ( ) n type doping of emitter
- ( ) formation of a good contact with metal electrode

No, the answer is incorrect.
Score: 0
Accepted Answers:
n type doping of emitter

3) What is the starting form of Si for production of semiconductor grade Si in Siemens process? *1 point*

- ( ) $SiHCl_3$
- ( ) $SiCl_4$
- ( ) Poly-Si
- ( ) SiH_2Cl_2

No, the answer is incorrect.
Score: 0
Accepted Answers:
$SiHCl_3$

4) n-type character of GaAs can be increased by? *1 point*

- ( ) Substituting Ga site with Indium
- ( ) Substituting Ga site with Al
- ( ) Substituting Sn at Ga site
- ( ) Substituting Zn at As site

No, the answer is incorrect.
Score: 0
Accepted Answers:
Substituting Sn at Ga site

5) Surface recombination in GaAs solar cells can be reduced by: *1 point*

- ( ) Heavy doping of the emitter
- ( ) ZnS/MgF_2 ARC coating
- ( ) Using p-AlGaAs as a window layer
- ( ) doping base lightly

No, the answer is incorrect.
Score: 0
Accepted Answers:
Using p-AlGaAs as a window layer

6) Hydrogenation of a-Si leads to: *1 point*

- [ ] reduction in shallow traps in the bandgap
- [ ] reduction in non-radiative recombination
- [ ] increase in the shunt resistance
- [ ] suppression in the tail-states within the bandgap

No, the answer is incorrect.
Score: 0
Accepted Answers:
reduction in non-radiative recombination
increase in the shunt resistance
suppression in the tail-states within the bandgap

7) For light absorption, a-Si solar cells primarily employ: *1 point*

- ( ) a thick p-type Si layer
- ( ) a thick n-type Si layer
- ( ) a thick intrinsic Si layer
- ( ) a thick p-Si/n-Si junction

No, the answer is incorrect.
Score: 0
Accepted Answers:
a thick intrinsic Si layer

8) In CdTe solar cells with superstrate configuration, which of the following is appropriate? *1 point*

- [ ] Light is absorbed in p-type CdTe layer.
- [ ] Light is absorbed in p-type CdS layer.
- [ ] Thickness of CdTe layer is approximately 100-500 nm.
- [ ] CdS layer is approximately 50-100 nm thin.

No, the answer is incorrect.
Score: 0
Accepted Answers:
Light is absorbed in p-type CdTe layer.
CdS layer is approximately 50-100 nm thin.

9) $CdCl_2$ treatment in CdTe solar cells results in: *1 point*

- [ ] Reduced radiative recombination
- [ ] n-type doping
- [ ] preferred orientation
- [ ] larger grain size

No, the answer is incorrect.
Score: 0
Accepted Answers:
preferred orientation
larger grain size

10) n-type character of CdTe solar cells can be improved? *1 point*

- [ ] Cadmium vacancies
- [ ] Doping with In
- [ ] Cadmium interstitials
- [ ] Doping with Au

No, the answer is incorrect.
Score: 0
Accepted Answers:
Doping with In
Cadmium interstitials

11) Which of the following strategies improve the performance of CdTe solar cells: *1 point*

- [ ] Use of Cu as back contact
- [ ] Heat treatment in oxygen
- [ ] Use of fine grained CdTe
- [ ] Intermixing between CdS and CdTe

No, the answer is incorrect.
Score: 0
Accepted Answers:
Use of Cu as back contact
Heat treatment in oxygen

12) In GaAs based solar cells, the absorber layer is general made of: *1 point*

- ( ) p-GaAs
- ( ) n-GaAs
- ( ) AlGaAs
- ( ) InGaAs

No, the answer is incorrect.
Score: 0
Accepted Answers:
n-GaAs

13) As compared to Si, GaAs has following attributes: *1 point*

- [ ] It has higher bandgap
- [ ] It has higher carrier mobility
- [ ] It is an indirect bandgap semiconductor
- [ ] It is diamond cubic structured

No, the answer is incorrect.
Score: 0
Accepted Answers:
It has higher bandgap
It has higher carrier mobility

14) Which of the forms of Si exhibits the lowest carrier mobility? *1 point*

- ( ) Single crystal Si
- ( ) Thick Polycrystalline Si
- ( ) Thin polycrystalline Si
- ( ) Amorphous Si

No, the answer is incorrect.
Score: 0
Accepted Answers:
Amorphous Si

15) Intermixing between CdS and CdTe in CdTe based solar cells leads to: *1 point*

- ( ) Reduction in quantum efficiency at lower wavelengths
- ( ) Reduction in quantum efficiency at higher wavelengths
- ( ) Increase in quantum efficiency at lower wavelengths
- ( ) Increase in quantum efficiency at higher wavelengths

No, the answer is incorrect.
Score: 0
Accepted Answers:
Reduction in quantum efficiency at lower wavelengths