FYSC23

Semiconductor lab

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Abstract

Contents

1   Introduction

Semiconductors are becoming more and more important for our society. One important application of semiconductors is light emitting diodes (LEDs) [1] which are used in e.g. displays and lighting, but also have application in medicine. LEDs also show a much better efficiency than earlier lightbulbs, thus decreasing energy consumption [1], something which is becoming increasingly more important. The basic part of the LED, the pn-junction, is also used in solar cells and can be used to produce energy from light [1].

2   Theory

2.1   Bandgap

2.2   Semiconductors

2.3   Doping

2.4   Pn-junction

2.5   LED

3   Experiment

3.1   Part 1

Wavelength white LED: 454.17 nm integration time 70 ms averaging every 10th measurements

| Mesurment	V_{in} (V)	V_{across} (V)	$I_{circuit}$ (mA)	Intensity (counts)
1	1	1.14	0.0	5.00
2	1.8	1.96	0.0	8.00
3	2.2	2.41	0.00	4.70
4	2.5	2.56	0.36	590.30
5	2.9	2.66	3.11	4377.70
6	3.3	2.72	6.21	7979.50
7	3.7	2.76	9.24	10846.90
8	4.4	2.84	15.24	16080.10
9	5.3	2.93	24.5	21958.10
10	6.5	3.02	35.2	27642.20
11	7.3	3.08	42.6	30184.80
12	8.3	3.15	52.0	33590.00
13	9.1	3.20	59.0	36153.70

Table 1: tab:part1

3.2   Part 1

Wavelength white LED: 596.85 nm integration time 2 ms averaging every 10th measurements

Before: V_{in} was 5.0 V, V_{across} 2.06 V, $I_{circuit}$ 30.8 mA and the intensity 2663.70
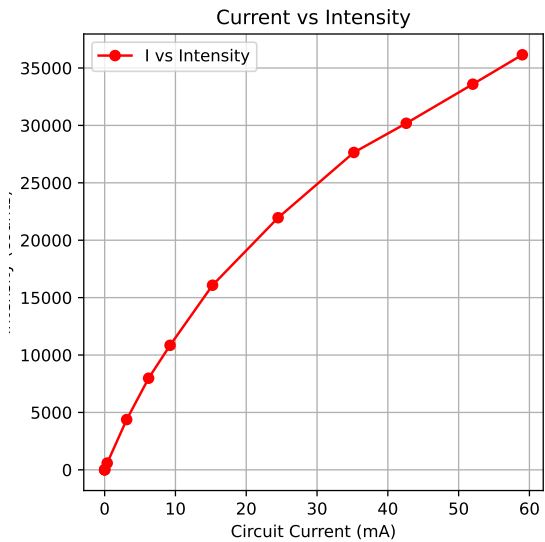
After: V_{in} was 5.0 V, V_{across} 4.44 V, $I_{circuit}$ 7.7 mA and the intensity 10752.70
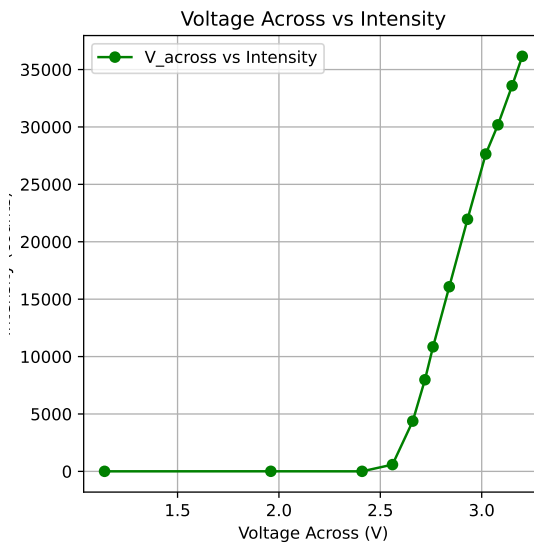
4   Result

4.1   Part 1
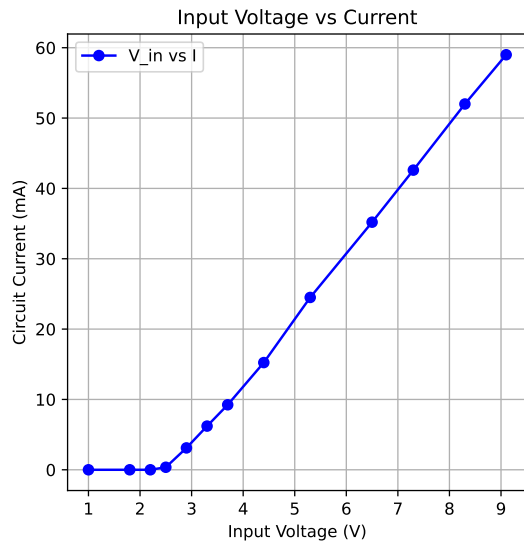
(a) Spring

(b) Summer

(c) Autumn

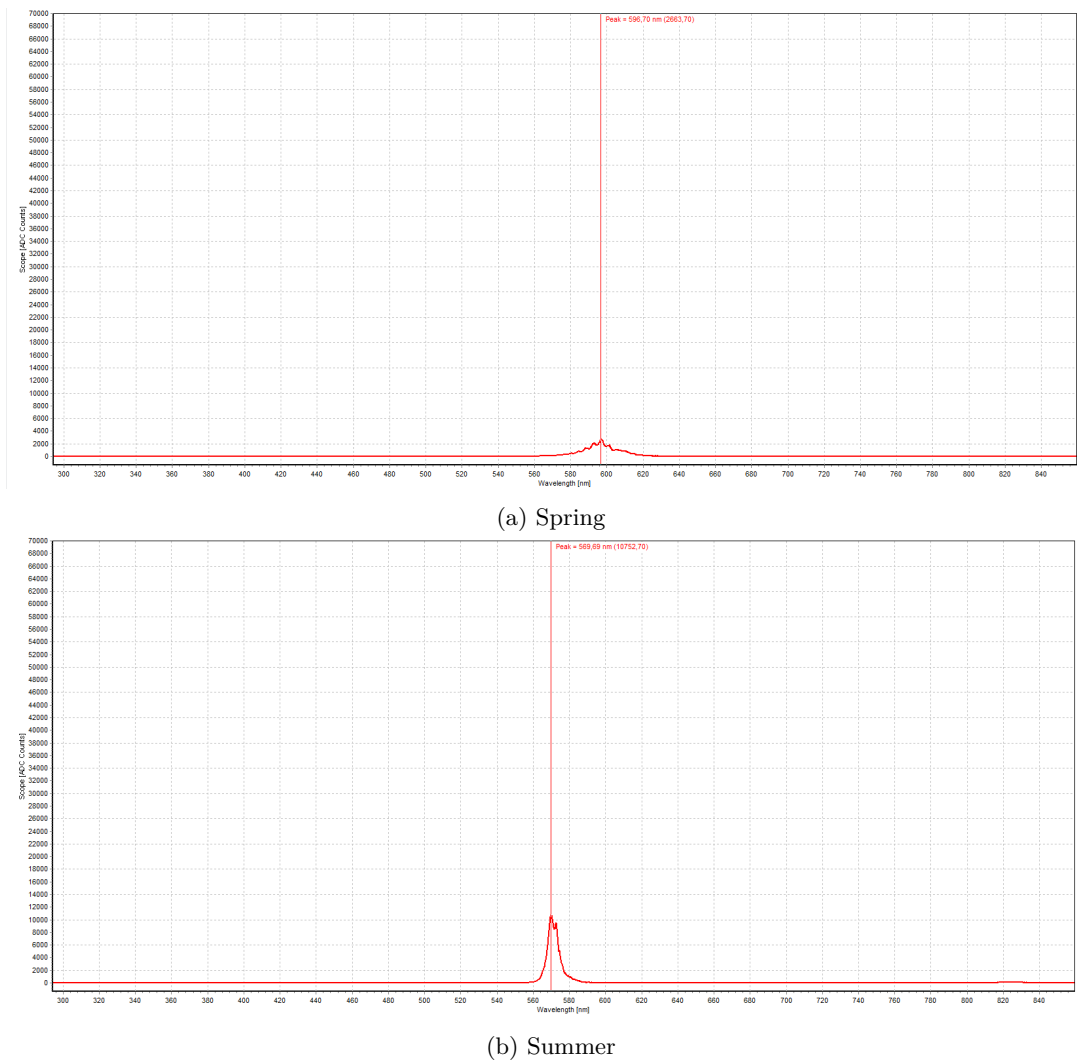Figure 1: Histograms for different seasons.

4.2   Part 2

(a) Spring

(b) Summer

Figure 2: ...

4.3   Part 3

Detector/Emitter	Red	Green	Blue
Red	Output	No output	No output
Green	Output	Output	No output
Blue	Output	Output	Output

Table 2: tab:part3

5 Discussion

6 Conclusion

References

[1] Philip Hofmann. *Solid State Physics: An Introduction.* Wiley-VCH, 2nd edition, 2015.