

Downloaded from UvA-DARE, the institutional repository of the University of Amsterdam (UvA)
<http://hdl.handle.net/11245/2.54452>

File ID	uvapub:54452
Filename	Contents
Version	unknown

SOURCE (OR PART OF THE FOLLOWING SOURCE):

Type	PhD thesis
Title	Time-Resolved Spectroscopy of Energy Transfers in Optoelectronic Media
Author(s)	I. Izeddin Aguirre
Faculty	FNWI: Van der Waals-Zeeman Institute (WZI)
Year	2008

FULL BIBLIOGRAPHIC DETAILS:

<http://hdl.handle.net/11245/1.279640>

Copyright

It is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), other than for strictly personal, individual use, unless the work is under an open content licence (like Creative Commons).

Contents

Symbols and Abbreviations	vii
Introduction	1
0.1 Semiconductors. Silicon	2
0.2 Optical doping	3
0.2.1 Rare earth ions	4
0.2.2 Silicon nanocrystals	5
1 Si/Si:Er multilayers	7
1.1 Donor-state enabling Er-related luminescence in silicon	8
1.1.1 Introduction	8
1.1.2 Experiment	9
1.1.3 Results and Discussion	10
1.1.4 Conclusions	16
1.2 Electro-optical memory effect for 1.5 μm photonics	17
1.2.1 Introduction	17
1.2.2 Preliminaries	18
1.2.3 Results	19
1.2.4 Discussion	22
1.2.5 Conclusions	25
2 Sensitization of Er^{3+} with silicon nanocrystals in a SiO_2 matrix	27
2.1 Nanoseconds dynamics of the 1.5 μm Er-related photoluminescence	31
2.1.1 Introduction	31
2.1.2 Results	31
2.1.3 Discussion	33
2.2 Energy transfer processes between Si NCs and Er^{3+}	39
2.2.1 Introduction	39

2.2.2	Results	40
2.2.3	Theory	47
2.2.4	Discussion	54
2.2.5	Conclusions	61
2.3	Space-separated quantum cutting	62
2.3.1	Introduction	62
2.3.2	Results	63
2.3.3	Discussion	67
2.3.4	Conclusions	70
3	Er-doped large band gap hosts	71
3.1	Photoluminescence and excitation spectroscopy of Er ³⁺ in GaN	71
3.1.1	Results	71
3.1.2	Discussion	74
3.2	On 2.7 μm emission from Er-doped large band gap hosts	77
3.2.1	Introduction	77
3.2.2	Experimental details	78
3.2.3	Results and discussion	78
3.2.4	Conclusions	82
A	Calculations of energy exchange between Si NCs and Er³⁺ ions	83
A.1	Excitation due to intra-band transition	84
A.2	Erbium excitation by the recombination of confined carriers	89
A.3	Dipole-dipole contribution	91
B	The relative quantum efficiency	93
	Bibliography	97
	Summary	103
	Samenvatting	107
	Acknowledgements	111