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Molecular and Nano-engineering with iron, ruthenium and carbon: Hybrid structures for sensing

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Molecular and Nano-Engineering with Iron, Ruthenium and Carbon: Hybrid Structures for Sensing

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"Questions are like fire / they need feeding to survive"

Them Crooked Vultures

"Man muß die Dinge so einfach wie möglich machen. Aber nicht einfacher."

Albert Einstein

To my parents,

and all who supported me

Table of Contents

List of Abbreviations 6

1. Introduction 9

1.1. Graphene and metal complexes: tools for engineers 10

1.2. Engineering with carbon – graphene based sensors 11

1.3. Iron complexes as molecular switches: spin crossover 18

1.4. Ruthenium complexes – a matter of light and dark 26

1.5. Aim of this thesis 30

1.6. References 31

2. Contactless spin switch sensing by chemo-electric gating of graphene 37

2.1. Introduction 38

2.1. Results and Discussion 40

2.2. Conclusions & Outlook 51

2.3. References and Notes 52

3. Large-area thin films of the spin crossover complex [Fe(bapbpy)(NCS)$_2$] grown selectively on graphene 55

3.1. Introduction 56

3.2. Results and Discussion 57

3.3. Conclusions & Outlook 66

3.4. Acknowledgements 67

3.5. References and Notes 67

4. Polymer-coated graphene-based gas sensors: chemical fingerprinting by simultaneous sensing 69

4.1. Introduction 70

4.2. Results and Discussion 72

4.3. Chemical fingerprint (CF) vapor sensors 80

4.4. Conclusions & Outlook 87

4.5. References and Notes 88

5. Monitoring a ruthenium-based photoreaction with graphene on paper 89

5.1. Introduction 90

5.2. Results and Discussion 92

5.3. Conclusions & Outlook 100
5.4. Acknowledgements 101
5.5. References and Notes 101
6. Reducing the translocation speed of DNA in solid-state nanopores by photolabile ruthenium complex decoration 103
6.1. Introduction 104
6.2. Results and Discussion 105
6.3. Conclusions & Outlook 111
6.4. Acknowledgements 111
6.5. References and Notes 111
7. [Ru(3)(biq)(STF-31)]$^{2+}$: A lock-and-kill anticancer PACT agent 113
7.1. Introduction 114
7.2. Results and Discussion 116
7.3. Conclusions & Outlook 122
7.4. References and Notes 123
8. Summary, Conclusions & Outlook 125
8.1 Summary 126
8.2 Conclusions and Outlook 133
Appendix Chapter 2 137
Appendix Chapter 3 153
Appendix Chapter 4 165
Appendix Chapter 5 185
Appendix Chapter 6 191
Appendix Chapter 7 195
Samenvatting, conclusies en vooruitzichten 209
List of publications 223
Curriculum Vitae 225
Acknowledgements 227

List of Abbreviations

(μ)RNA	(micro)-ribonucleic acid
(ADF)-STEM	(annular dark-field)- scanning transmission electron microscopy
(ATR)-IR	(attenuated total reflection) infrared spectroscopy
(ct)DNA	(calf thymus) deoxyribonucleic acid
(LC/HR)-MS	(liquid chromatography/high resolution) mass spectrometry
(r)GO	(reduced) graphene oxide
acac	acetylacetonate
AFM	atomic force microscopy
ANO-RCC	atomic natural orbitals (relativistic and (semi-)core correlation)
APS	ammonium persulfate
APTES	3-aminopropyltriethoxysilane
bapbpy	N,N′-di(pyrid-2-yl)-2,2′-bipyridine-6,6′-diamine
bbpya	N,N-bis(2–2′-bipyrid-6-yl)amine
biq	2,2'-biquinoline
bpy	2,2'-bipyridine
bpz	dihydrobis(pyrazolyl)borate
CAB	cellulose acetate butyrate
CAS(SCF)	complete active space (self-consistent field)
CEG	chemo-electric gating
CF	chemical fingerprint
CITS	current-imaging-tunneling spectroscopy
dAMP	2-deoxyadenosine monophosphate
dCMP	2-deoxycitydine monophosphate
dGMP	2-deoxyguanosine monophosphate
dTMP	2-deoxythymidine monophosphate
DCC	N,N'-dicyclohexylcarbodiimide
DCM	dichloromethane
DEME-TFSI	diethylmethyl(2-methoxyethyl)ammonium bis(trifluoromethylsulfonyl)imide
DMAP	4-dimethylaminopyridine
DMF	dimethylformamide
DMSO	dimethylsulfoxide
dppz	dipyrido[3,2-a:2′,3′-c]phenazine
EDTA	ethylenediaminetetraacetic acid

EDX	energy-dispersive X-ray spectroscopy
Elem. Anal.	elemental analysis
EM	emission wavelength
Et_2O	diethyl ether
EX	excitation wavelength
GC	gas chromatography
GFET	graphene field effect transistor
GLUT1	glucose transporter, type 1
GS	ground state
HFIP	1,1,1,3,3,3-hexafluoro-2-propanol
HOPG	highly oriented pyrolytic graphite
HS	high spin
Htrz	1H-1,2,4-triazole
IC50	half maximal inhibitory concentration
ICYTES	3-isocyanateproyltriethoxysilane
IL	ionic liquid
IP	intermediate phase
IPA	isopropyl alcohol
ITO	indium tin oxide
KNN	k-nearest neighbor
LDA	local density approximation
LED	light-emitting diode
LF	ligand field
LS	low spin
MC	metal center
MEAS	measurement (transistor name)
MeOH	methanol
MOF	metal organic framework
MLCT	Metal-to-ligand charge transfer
NAMPT	nicotinamide phosphoribosyltransferase
NB	Naive Bayesian
NH_2trz	4-amino-1,2,4-triazole
NMR	nuclear magnetic resonance
NP	nanoparticle
OTMS	octadecyltrimethoxysilane
PACT	photoactivated chemotherapy
PAH	polyaromatic hydrocarbon
PCA	principle component analysis
PDMS	polydimethylsiloxane

PDT	photodynamic therapy
phen	1,10-phenanthroline
pic	2-pyridine carboxylate
PMMA	poly(methyl methacrylate)
PTFE	polytetrafluoroethylene
QY	quantum yield
RBF	radial basis function
REF	reference (transistor name)
RF	Random Forest
ROS	reactive oxygen species
RPA	random phase approximation
RT	room temperature
sal	saliva
SCO	spin crossover
SERS	surface-enhanced Raman spectroscopy
SiN	silicon nitride
SMV	Support Vector Machines
SPPR	surface plasmon-polariton resonance
SPR	surface plasmon resonance
SQUID	superconducting quantum interference device
STF-31	4-((4-t-butyl)phenylsulfonamido)methyl)-N-(pyridin-3-yl)benzamide
STM	scanning tunneling microscopy
TCYTES	3-thiocyanatepropyltriethoxysilane
TEM	transmission electron microscopy
TLC	thin-layer chromatography
tpy	2,2′:6′,2″-terpyridine
UV-vis	ultraviolet-visible spectroscopy
XPS	X-ray photoelectron spectroscopy
XRD	X-ray diffraction