

To my father, Keivan Deravi, who has been my greatest source of inspiration
and
my mother, Fariba, my sister, Yasi, and my little brother, Sahm
for their infinite love and support

ACKNOWLEDGEMENTS

Sometime between my third and fourth year, I realized that the one of the major factors responsible for keeping a student motivated in graduate school is his or her capability to hope for the best, even if everything suggests that maybe you should not. This idea has helped me trudge through the many obstacles in graduate school, especially when faced with that indiscriminating nature of failure, but would certainly not have been possible without the support of some of the wonderful people I have encountered along the way.

I think it is rare to be able to look back and remember the exact day and time that a thesis project is decided, but I can do it. After one Wednesday night group meeting, I wandered into Dr. Wright's office, telling him, "I want to work on that printer." And without any questions he responded, "Ok, then." From that day on, after one simple response, a thesis project was decided, and my life has never been the same. None of my progress or successes in graduate school would have been possible without the exceptional enthusiasm behind *almost* everything I suggested, coming from my boss, David Wright. Balancing three completely different subgroups in one research lab can really stretch a man thin, but Dr. Wright always found time to help me when I needed it, and for that, I am and will always be eternally grateful.

I would also like to extend great thanks to Dr. Jan Sumerel, for all of the amazing opportunities she has extended to me in the name of inkjet printing. Additionally, to my dissertation committee members, Dr. Lukehart, Dr. Harth, and Dr. Rogers, I thank you for all of the constructive discussions during my committee meetings. Without all of your help, direction, and motivation, I obviously could not be here today.

Throughout my graduate career, I have had the privilege of experiencing a dynamic team environment everyday in the lab, and for this, I would like to thank all of my labmates, who for better or for worse, have been very supportive. Among others, I thank Melissa Carter, Anh Hoang, Alex Rutledge, Vanessa Scott, Josh Swartz, Jonas Perez, Kristin Halfpenny, Reese Harry, Catherine Prudom, Becca Sandlin, and Stephen Jackson for all of their help. I would also like to extend some extraordinary thanks to some past lab members: Aren Gerdon and Sarah Sewell. Dr. Gerdon spent a lot of time working with me during my first year, inadvertently teaching me that the key to a graduate school is balancing research, writing, and ambition. Dr. Sewell, similarly, helped me get started in research with her mentorship and her positive attitude. Among all the people I have worked with in lab, I must bestow the biggest THANK YOU to Dr. Ryan Rutledge for his infinite patience with me as my bay-mate, everyday for two and a half years. His cool and calming personality was a sweet relief from the *high's* and *low's* of research, and for that I will always be grateful.

Because of the broad nature of my research project, I have had the opportunity to work with a number of exceptional scientists outside of my research group, as well. For the progress made throughout my final year in graduate school, I would like to thank the entire Cliffel lab, specifically Jeremy Wilburn, Jennifer Merritt, and Rachel Snider, for their helpful discussions in electrochemistry, and Dr. David Cliffel, especially, for putting faith in me, in spite of the fact that I have never taken an electrochemistry course in my life.

Finally, I would like to thank my entire family, to whom I have dedicated my thesis. Their love for me has always been absolute, and I thank them for being incredibly

supportive during my years in graduate school. Along the same lines, I would like to thank Brian Smith for his friendship, love, and support. His hard-work and dedication to research has inspired me on countless occasions. Most importantly, when times would get rough, he was there for me, always reassuring that “Everything will work out.” And it always did.

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LIST OF ABBREVIATIONS

AFM:	atomic force microscope
BT:	barium titanate
BSA:	bovine serum albumin
CAD:	computer-aided design
CAM:	computer-aided manufacturing
CCD:	charge coupled device
CCMV:	Cowpea chlorotic mottle virus
-C _f :	sensitivity factor for QCM
CE:	counter electrode
CSD:	cell surface display
CV:	cyclic voltammogram
CVD:	chemical vapor deposition
DIC:	differential interference contrast
DLS:	dynamic light scattering
DSC:	differential scanning calorimetry
DIW:	direct ink writing
DMP:	Dimatix Materials Inkjet Printer
dpi:	drops per inch
DLS:	dynamic light scattering
DMF:	N,N-dimethylformamide
e-beam:	electron beam

ECM:	extracellular matrix
EFM:	electrostatic force microscopy
e-jet:	electrohydrodynamic jet printing
ET:	electron transfer
Δf :	change in frequency
FcTMA:	ferrocenylmethyltrimethylammonium hexafluorophosphate
FESEM:	field-emission scanning electron microscopy
FETEM:	field-emission transmission electron microscopy
FTIR:	fixed transmittance infra-red spectroscopy
G(X):	generation (x) (specifically for dendrimers)
GOx:	Glucose Oxidase
HPLC:	high performance liquid chromatography
HRTEM:	high resolution transmission electron microscopy
IJP:	inkjet printing
LB:	langmuir-blodgett
LCST:	lower critical solution temperature
MALDI-TOF:	matrix assisted laser desorption ionization – time of flight mass spectrometry
Δm :	change in mass
MEM:	micro-electro-mechanical
MPC:	monolayer protected cluster
MTB:	magnetotactic bacteria
mwCNT:	multi-wall carbon nanotube

NMR:	nuclear magnetic resonance
PAMAM:	polyamidoamine
PD:	phage display
PDMS:	poly(dimethylsiloxane)
PEDOT/PSS:	poly(3,4-ethylenedioxythiophene) poly(styrenesulfonate)
PEG:	poly ethylene glycol
PPI:	polypropylenimine
PZT:	lead zirconate titanate
QCM:	quartz crystal microbalance
r_g :	insulating sheath radii
r_e :	the Pt electrode radii
ΔR_L :	loading resistance
RE:	reference electrode
RGD:	arginine glycine aspartate
RuHex:	ruthenium (III) hexamine chloride
SAED:	selected area electron diffraction
SAM:	self assembled monolayer
SEM:	scanning electron microscopy
SPM:	scanning probe microscopy
SSF:	solid free-form printing
SSP:	syringe solenoid jet printing
STM:	scanning tunneling microscopy
STL:	stereolithography apparatus

SWNT:	single-walled carbon nanotube
TEM:	transmission electron microscopy
TEOS:	tetraethylorthosilicate
TFT:	thin-film transistors
TGA:	thermogravimetric analysis
TMOS:	tetramethylorthosilicate
TOF:	time of flight
UME:	ultramicroelectrode
UV:	ultraviolet
WE:	working electrode
XPS:	x-ray photoelectron spectroscopy
XRD:	x-ray diffraction