Towards superconducting spintronics with RuO2 and CrO2 nanowires

Prateek, K.

List of Publications

- C. Yin, **K. Prateek**, W. Gelling and J. Aarts. Tunable Magnetic Scattering Effects at the $LaAlO_3/SrTiO_3$ Interface by Ionic Liquid Gating, *ACS Applied Electronic Materials* **2** (12), 3837-3842 (2020).
- **K. Prateek**, M. Bolhuis, A.B. Hamida, D. Scholma, S. C. Boj and J. Aarts. Magnetotransport properties of CrO_2 nanowires fabricated by Selective Area growth, *Journal of Physics and Chemistry of Solids* **178**, 111350 (2023).
- J. Yao, **K. Prateek**, M. Cabero-Piris and J. Aarts. Non-local Spin Transport based on a Half-metallic Ferromagnet, *Phys. Rev. Materials* **7**, 104408 (2023).
- **K. Prateek**, T. Mechielsen, A.B. Hamida, D. Scholma and J. Aarts. Fabrication and properties of lateral Josephson junctions with a RuO_2 weak link, *under review*.

CurriculumVitae

Kumar Prateek

Education

2005-09	SASTRA University	
	BTech. in Electronics and Instrumentation Engineering	
	Thesis:	Monitor & Control of interdependent parameters using Fuzzy Logic Controller
	Supervisor:	Dr. N. A. Kumar
2012-14	Leuven University and T.U. Dresden	
	Erasmus Mundus Masters in Nanoscience and Nanotechnology	
	Thesis:	Aharonov-Bohm oscillations in a 3D long-perimeter Bi_2Te_3 nanowire
	Supervisor:	Dr. R. Giraud
2017-23	Leiden University	
	PhD in Physics	
	Thesis:	Towards Superconducting Spintronics with RuO_2 and CrO_2 nanowires
	Supervisor:	Prof.dr. J. Aarts

Professional Experience

2009-12	Tata Consultancy Services, India
	Systems Engineer
2014-16	Robotics Core School, India
	Electronics Engineer

Acknowledgements

This thesis could not have been completed without the support of many people during my PhD time. First and foremost, I would like to express my sincere gratitude to Jan Aarts, my promoter, for giving me the opportunity to join his group and further my academic pursuits. I am deeply thankful of his unwavering guidance and support in spite of his extremely hectic schedule. I greatly value the extensive knowledge and comprehensive overview of physics that he graciously shared with compassion and modesty.

I would like to thank Sonia Conesa-Boj and Maarten Bolhuis, my collaborators at Delft, for the TEM measurements on the CrO_2 nanowires. I appreciate the insightful and stimulating discussions we had while writing the paper. I want to thank Aymen Ben Hamida, with whom I worked closely on most of the projects. I am thankful for his continuous mentorship and support, encompassing our numerous discussions and teaching me the intricacies of systematic measurement. My sincere thanks to Nikita Lebedev for acquainting me with PPMS and subsequently assisting me with the configuration for the pulse measurements. Douwe Scholma and Thomas Mechielsen deserve special recognition for their assistance with the fabrication process and discussions pertaining to CrO_2 and RuO_2 projects. I am grateful for their nearly instantaneous technical assistance, despite their packed schedule.

I am indebted to Marcel Hesselberth for his invaluable guidance and technical assistance. I could always count on him for solving the issues with ebeam lithography and evaporator. I want to thank and appreciate the technical support from Federica Galli for introducing me to AFM lab; Christian Penn and Ruud van Egmond from fine mechanical department for CVD setup; Peter van Veldhuizen of Electronics department who was consistently accessible to assist in resolving numerous PPMS issues and designing the high frequency pulse measurement setup. I express my gratitude to Danielle Duijn for her assistance pertaining to day to day administrative affairs.

I want to thank the former students Brecht Simon, Amber Zitman who made contributions to my research. I also want to thank all the current and former members of LION and MSM group: including Amrita Singh, Tamer Karaman, Chunhai Yin,

Kaveh Lahabi, Remko Fermin, Junxiang Yao and Xing Chen for their invaluable assistance throughout the duration of my PhD and for promoting a pleasant working environment.

I wish to convey my profound appreciation to Subhasis Adhikari for his invaluable assistance in both my professional and personal life, serving as a mentor and friend. I could rely on his expertise and experience at all times. His support made it feasible to complete this thesis. I want to thank Kasinath Ojha and Nurul Amin for all the food and fun times that helped me recharge.

Lastly, I owe my deepest gratitude to my parents who have made innumerable sacrifices to ensure that I have a good life and my sister who has consistently provided me with encouragement and support. Lastly, I would like to express my deepest appreciation for my wife for her unwavering support, encouragement, love, and sacrifices; she has stood by my side through thick and thin. Thank you for everything.