

TODD AUSTIN ZAPATA

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EXPERIENCE

FEB 2022 – CURRENT

PHYSICS PROFESSOR, HOUSTON COMMUNITY COLLEGE

Create lectures and exams for introductory physics for science and engineering majors and non-scientific majors. Give 2-3 hour in-class lectures and prepare and lead laboratories for introductory physics.

NOV 2020 – MAR 2021

POSTDOC, INSTITUTE FOR QUANTUM OPTICS, UNIVERSITY OF ULM

Researcher for the Post Lithium Storage (POLis) cluster of excellence program. Conducted spin-manipulation experiments on Nitrogen-vacancy ensembles for ion transport measurement. Designed/constructed a Raman spectroscopy microscope system for diamond anvil cell experiments. FPGA programming for use in scanning confocal microscope systems.

FEB 2017 – DEC 2019

POSTDOC, MAX PLANCK INSTITUTE FOR POLYMER RESEARCH

Designed and constructed high-pressure high-temperature laboratory and confocal microscope system for nanodiamond synthesis experiments and quantum analysis. Programmed FPGA for quantum optics analysis (i.e. Optically Detected Magnetic Resonance (ODMR)) of color-center defects in diamond. Researched and developed protocols for engineering nanodiamonds with color-center defects.

JAN 2013 – DEC 2016

VISITING RESEARCHER, CARNEGIE INSTITUTION OF WASHINGTON

Conducted high-pressure high-temperature diamond anvil cell experiments using laser and furnace heating for preliminary results of nanodiamond synthesis techniques. Analyzed the results using Raman and scanning electron microscopy.

JAN 2013 – DEC 2019

VISITING RESEARCHER, UNIVERSITY OF ULM – INSTITUTE FOR QUANTUM OPTICS

Studied the theoretical and experimental aspects of the NV center in diamond. Conducted quantum coherence measurements including scanning confocal fluorescent microscopy, HRTEM, optically detected magnetic resonance, Rabi oscillations and anti-bunching of the NV center in nanodiamond. Built power supplies and programmed FPGAs using Python and VHDL for scanning confocal microscopy systems.

EDUCATION

DEC 2015

PHD ELECTRICAL ENGINEERING, TEXAS A&M UNIVERSITY

Invented method to synthesize nanodiamonds that has been patented; uses for the patent include solid state quantum computing devices, *in situ* biological diagnostics and drug delivery. Aided laboratory classes in operational amplifier experimentation. Designed and built power supplies and amplifiers using micro-electronic circuitry, PCB, LabView, Python and FPGAs.

DEC 2007

MS PHYSICS, TEXAS A&M UNIVERSITY

MS thesis used computer simulations and WKB approximations to solve a quantum boundary-value problem with no analytical solution.

MAY 2005

BS NUCLEAR ENGINEERING, TEXAS A&M UNIVERSITY

Member of the nuclear engineering honor society, Alpha Nu Sigma.

PUBLICATIONS

Zapata, Todd, et.al. "Fluorescent nanodiamond growth from molecular precursors." *Carbon*. Still in review.

Zapata, Todd, et al. "Organic Nanodiamonds." arXiv:1702.06854v1 [physics.chem-ph], 22 February 2017.

Liang, Jiaxu, et al. "Germanium iodide mediated synthesis of nanodiamonds from adamantane "seeds" under moderate high-pressure high-temperature conditions." *Diamond and Related Material*, vol. 108, October 2020.

Hemmer, Philip, et. al. "Engineered Fluorescent Nanodiamonds." United States Patent US20170292069A1, filed October 12, 2016, and still pending.

Fulling, Stephen and Zapata, Todd "WKB propagators in position and momentum space for a linear potential with a 'ceiling' boundary." *Journal of Physics A: Mathematical and Physical*, vol. 50, no. 10, 6 February 2016.

Hemmer, Philip and Zapata, Todd. "The universal scaling laws that determine the achievable resolution in different schemes for super-resolution imaging." *Journal of Optics*, vol. 14, no. 8, 2012.