

Volodymyr B. Koman, PhD

PATENT AGENT

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Dr. Volodymyr Koman assists Choate's life sciences clients by utilizing his background in biomedical and chemical engineering to help with the preparation and prosecution of patent applications, as well as freedom-to-operate and patentability analyses.

Prior to joining Choate, Dr. Koman was a Research Scientist in the Department of Chemical Engineering at Massachusetts Institute of Technology (MIT), where he developed biomedical nanosensors for studying enclosed environments, such as the human body and plants.

During his PhD in Microengineering at EPFL, Switzerland, Volodymyr developed optical sensors for studying nanotoxicity in microorganisms. He received his Masters in Photonics at Ghent University, Belgium, where he was building a micro-Raman optical system for analyte identification, and he received his Bachelors in Applied Physics at Ivan Franko National University, Ukraine, where he studied optical properties of mixed salt crystals.

Among his most significant breakthroughs, Volodymyr invented Colloidal Electronics – the smallest robots yet that can sense their environment, store data, and even carry out computational tasks, thus revolutionizing the way we are able to conduct diagnostic evaluation of all kinds. He also invented Thermal Resonators to harvest energy from thermal fluctuations, nanosensors printed onto plant leaves to reveal when plants are experiencing a water shortage as a form of Plant Nanobionics effort, and a novel photonic technique called Wavelength-Induced Frequency Filtering that overcomes earlier limitations on sensor implantation depth, opening a host of new possibilities for tracking molecules in the brain and other tissues deep within the body in applications such as medical diagnosis or monitoring drug effects.

Focus Areas

Intellectual Property

IP Counseling

Publications and Presentations

- "A wavelength-induced frequency filtering method for fluorescent nanosensors *in vivo*", first author, *Nature Nanotechnology*, June 2022
- "Atomically Thin 2D Interfaces as Sensors for Molecular Permeability through Cellular Layers and Thin Tissues", first author, *Advanced Functional Materials*, April 2022
- "Emergent microrobotic oscillators via asymmetry-induced order", co-author, *Nature Communication*, October 2022
- "Cellular Lensing and Near Infrared Fluorescent Nanosensor Arrays to Enable Chemical Efflux Cytometry", co-author, *Nature Communication*, May 2021
- "Real-time detection of wound-induced H2O2 signalling waves in plants with optical nanosensors", co-author, *Nature Plants*, April 2020

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- "Chloroplast-selective gene delivery and expression in planta using chitosan-complexed single-walled carbon nanotube carriers," co-author, *Nature Nanotechnology,* February 2019
- "Colloidal nanoelectronic state machines based on 2D materials for aerosolizable electronics," first author, *Nature Nanotechnology,* July 2018
- "Autoperforation of 2D materials for generating two-terminal memristive Janus particles", co-author, *Nature Materials*, November 2018
- "Ultra-high thermal effusivity materials for resonant ambient thermal energy harvesting," co-author, *Nature Communication,* February 2018
- "Nitroaromatic detection and infrared communication from wild-type plants using plant nanobionics", co-author, *Nature Materials*, February 2017

Education & Credentials

- Swiss Federal Institute of Technology, PhD (2015) Photonics
- Ghent University, MS (2011) greatest distinction, Photonics
- Ivan Franko National University, BS (2009) *summa cum laude*, Applied Physics

Admissions

- U.S. Patent & Trademark Office