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EDUCATION

1990	Ph.D. in Physical Chemistry (with Professor George E. Ewing) Indiana University, Bloomington, Indiana, USA
1983	M.S. in Agricultural Chemistry (with Professor Kun-Huang Houng) National Taiwan University
1981	B.S. in Agricultural Chemistry, National Taiwan University

ACADEMIC POSITIONS

8/2016 – present	Joint Appointment Professor Department of Chemistry, National Taiwan Normal University
8/2014 – present	Honorary Chair Professor Department of Chemical Engineering, National Taiwan University of Science and Technology
7/2013 – present	Distinguished Research Fellow Institute of Atomic and Molecular Sciences, Academia Sinica
8/2007 – 7/2012	Joint Appointment Professor Department of Chemistry, National Taiwan University
8/2004 – 7/2009	Joint Appointment Professor Department of Chemistry, National Taiwan Normal University
3/2000 – 7/2013	Research Fellow Institute of Atomic and Molecular Sciences, Academia Sinica
2/2002 – 7/2003	Adjunct Professor Department of Chemistry, National Taiwan Normal University
8/2000 – 1/2001	Adjunct Professor Department of Chemistry, National Taiwan University
7/1995 – 12/1995	Visiting Scientist (with Professor Yuan T. Lee) Department of Chemistry, University of California, Berkeley, California, USA
1/1994 – 3/2000	Associate Research Fellow Institute of Atomic and Molecular Sciences, Academia Sinica
7/1990 – 12/1993	Postdoctoral Fellow (with Professor William A. Klemperer) Department of Chemistry, Harvard University, Cambridge, Massachusetts, USA
8/1983 – 7/1984	Research Assistant Department of Chemistry, National Taiwan University

ACADEMIC SERVICES

2018	Chairman 10th Asian Photochemistry Conference (APC2018)
1/2015 – 12/2018	Councilor Asian and Oceanian Photochemistry Association (APA)
1/2012 – 9/2016	Deputy Executive Secretary Central Academic Advisory Committee, Academia Sinica

1/2012 – 12/2013	Coordinator Molecular Science and Technology Program, Taiwan International Graduate Program (TIGP), Academia Sinica
1/2006 – 9/2014	Associate Editor Journal of the Chinese Chemical Society, Taipei
1/2005 – 12/2007	Panel Member Division of Chemistry, National Science Council

HONORS AND AWARDS

2025	Best Article Award – Journal of the Chinese Chemical Society (《JCCS》年度最佳論文獎)
2025	National Innovation Excelsior Award of Taiwan Government (國家新創精進獎)
2024	NSTC Research Fellow (國科會傑出特約研究員)
2023	FutureTech Award, National Science and Technology Council (國科會未來科技獎)
2021	Academic Achievement Award, Chemical Society Located in Taipei (中國化學會學術獎章)
2021	National Innovation Excelsior Award of Taiwan Government (國家新創精進獎)
2020	Outstanding Research Award, Taiwan Nanomedicine Society (臺灣奈米生醫學會傑出研究獎)
2019	Best Article Award, Journal of the Chinese Chemical Society, Taipei (中國化學會會誌108年度最佳論文獎)
2019	National Innovation Award of Taiwan Government (第16屆國家新創獎)
2019	The Franco-Taiwanese Scientific Grand Prize (台法科技獎)
2019 – 2023	Academia Sinica Investigator Award (中央研究院深耕計畫)
2017	Far Eastern Y. Z. Hsu Chair Professor (有庠科技講座)
2017	FutureTech Demo and Breakthrough Award, Ministry of Science and Technology (科技部未來科技突破獎)
2015	Outstanding Research Award, Ministry of Science and Technology (科技部傑出研究獎)
2014	Ho Chin Tui Award (侯金堆傑出榮譽獎)
2014	Best Article Award, Journal of the Chinese Chemical Society, Taipei (中國化學會會誌103年度最佳論文獎)
2014 – 2017	Science Vanguard Research Program, Ministry of Science and Technology (科技部卓越領航研究計畫)
2013 – 2017	Academia Sinica Investigator Award (中央研究院深耕計畫)
2010 – 2013	Science Vanguard Research Program, National Science Council (國科會卓越領航研究計畫)
2008	Academic Award of Ministry of Education (第52屆教育部學術獎)
2007 – 2011	Outstanding Scholar Award of Foundation for the Advancement of Outstanding Scholarship (傑出人才基金會傑出人才講座)
2007 – 2011	Academia Sinica Investigator Award (中央研究院深耕計畫)
2003	Outstanding Research Award, National Science Council (國科會傑出研究獎)
2001	Distinguished Young Researcher Award of Tsing-Hua Foundation of Chemistry Technology (第2屆清華化學科技文教基金會傑出青年學者)
1998	Academia Sinica Research Award for Junior Researchers (中央研究院年輕學者著作獎)

PUBLICATIONS

- ***Books***

1. Y. Y. Hui, H.-C. Chang, H. Dong, and X. Zhang (Eds.), *Carbon Nanomaterials for Bioimaging, Bioanalysis, and Therapy*, Wiley (2019) (*376pp*).
2. H.-C. Chang, W. W.-W. Hsiao, and M.-C. Su, *Fluorescent Nanodiamonds*, Wiley (2019) (*296pp*).

- ***Research Articles***

252. T.-N. Le* and H.-C. Chang*, "Cell labeling with fluorescent nanodiamonds for visualization and manipulation," *Methods Mol. Biol.* (2026) accepted.
251. M. J. N. Descanzo, Y.-C. Chen, M.-C. Chung, N. N. B. Ngoc, A. A. Patil, P.-C. Soo, Y.-T. Horng, C.-L. Cheng, H.-C. Chang, R.-Y. Chang, and W.-P. Peng*, "Profiling high-abundance serum proteins in the corona of nanodiamonds using mass spectrometry," *Langmuir* (2026) DOI: 10.1021/acs.langmuir.5c06674.
250. T.-N. Le, X. M. Lam, Y.-X. Tang, Y. Y. Hui, A.-J. Liu, and H.-C. Chang*, "Quantum spin detection in microfiltration immunoassays for ultrasensitive and high-throughput diagnostics," *Anal. Chem.* **98**, 4562–4570 (2026).
249. Y. Y. Hui*, Y.-M. Tsui, Y.-X. Tang, and H.-C. Chang*, "Ultrathin fluorescent nanodiamond films for nanoscale quantum sensing in operando semiconductor devices," *Adv. Funct. Mater.* **36**, e13406 (2026).
248. N. Lu*, G. Gurumallappa, P. Y. Liu, K. L. Chan, Y.-C. Huang, Y.-C. Lin, Y.-T. Hsieh, P.-X. Zeng, Y. Gowda, M.-H. Tsai, E. Tessema, H.-C. Chang, and J. Francisco*, "Neutron diffraction and spectroscopic studies of intramolecular tetrel bonds in three fluorinated zinc complexes: Significant redshift in the sp^3 C−H stretch confirmed by experiments and theory," *J. Am. Chem. Soc.* **147**, 45270–45282 (2025).
247. Y.-X. Tang, Y. Y. Hui, A.-J. Liu, W. W.-W. Hsiao, and H.-C. Chang*, "Quantitative laser-scanning lateral flow immunoassay of luteinizing hormone with a handheld analyzer," *J. Chin. Chem. Soc.* **72**, 693–701 (2025).
246. T.-I. Yang, Y. Y. Hui, P.-J. Wu, T.-P. Huang, B.-M. Cheng, Y.-Y. Lee, and H.-C. Chang*, "Light yields of diamonds with nitrogen-vacancy centers as scintillators for ionizing radiations from 80 to 1200 eV," *J. Phys. Chem. C* **129**, 2739–2746 (2025).
245. Y. Y. Hui, C.-Y. Ho, T.-I. Yang, T.-P. Huang, B.-M. Cheng, Y.-Y. Lee, and H.-C. Chang*, "Fluorescent nanodiamond scintillators for beam diagnostics of EUV and soft X-ray in photolithographic applications," *RSC Adv.* **15**, 1011–1019 (2025).
244. S. C. Wang, P.-Y. Lin, J.-C. Yang, J. L. Gutmann, H.-C. Chang H.-M. Huang*, and S.-C. Hsieh*, "Micro-CT evaluation of a nanodiamond irrigant for hard-tissue debris removal during sonic agitation," *Int. Endo. J.* **58**, 346–356 (2025).
243. G. Gurumallappa, C.-F. Chiu, C.-L. Ho, H.-C. Chang, H. M. Krishnegowda, N. K. Lokanath, and N. Lu*, "Synthesis, structure and non-covalent interactions of *trans*-[2-$(HCF_2(CF_2)_3CH_2OCH_2)_2$-py-$PdCl_2$] complex: rare C−F···F−C halogen bonds and blue-shifting C−H···X hydrogen bonds," *J. Mol. Struct.* **1322**, 140303 (2025) (*12pp*).
242. D. Duan*, V. K. Kavatamane, S. R. Arumugam, H.-C. Chang, and G. Balasubramanian*, "Nitrogen-vacancy centers as a self-gauged micro-scale heater and its application for multi-modal sensing," *Appl. Phys. Lett.* **125**, 132202 (2024) (*6pp*).
241. W. W.-W. Hsiao*, S. Angela, T.-N. Le, G. Fadhilah, W.-H. Chiang, and H.-C. Chang, "Diagnostics of Alzheimer's disease using fluorescent nanodiamond-based spin-enhanced lateral flow immunoassay," *Microchem. J.* **205**, 111315 (2024) (*9pp*).
240. S.-Y. Liang, M. I. C. Estayan, L.-W. Hsieh, M.-C. Pan, K. X. Li, H.-C. Chang, and W.-P. Peng*, "Real-time monitoring of the evaporation and fission of electrospray-ionized polystyrene beads and bacterial pellets at elevated temperatures," *Anal. Chem.* **96**, 7179–7186 (2024).

239. T.-N. Le, M. J. N. Descanzo, W. W.-W. Hsiao, P.-C. Soo, W.-P. Peng, and H.-C. Chang*, "Fluorescent nanodiamond immunosensors for clinical diagnostics of tuberculosis," *J. Mater. Chem. B* **12**, 3533–3542 (2024).
238. H.-Y. Wu*, G. Kabacaoğlu, E. Nazockdast, H.-C. Chang, M. J. Shelley, and D. J. Needleman, "Laser ablation and fluid flows reveal the mechanism behind spindle and centrosome positioning," *Nat. Phys.* **20**, 157–168 (2024).
237. N. Varkentina, Y. Auad, S. Y. Woo, F. Castioni, J.-D. Blazit, M. Tencé, H.-C. Chang, J. Chen, K. Watanabe, T. Taniguchi, M. Kociak, and L. H. G. Tizei*, "Excitation lifetime extracted from electron-photon (EELS-CL) nanosecond-scale temporal coincidences," *Appl. Phys. Lett.* **123**, 223502 (2023).
236. T.-I. Yang, Y.-Y. Hui, J.-I. Lo, Y.-W. Huang, Y.-Y. Lee, B.-M. Cheng*, and H.-C. Chang*, "Imaging extreme ultraviolet radiation using nanodiamonds with nitrogen-vacancy centers," *Nano Lett.* **23**, 9811–9816 (2023).
235. H.-H. Lin, C.-Y. Wang, F.-J. Hsieh, F.-Z. Liao, Y.-K. Su, M. D. Pham, C.-Y. Lee, H.-C. Chang*, and H.-H. Hsu*, "Nanodiamonds in oil emulsions elicit potent immune responses for effective vaccination and therapeutics," *Nanomedicine* **18**, 1045–1059 (2023).
234. H. Wen, D. Kordahl, I. Kuschnerous, P. Reineck, A. Macmillan, H.-C. Chang, C. Dwyer, and S. L. Y. Chang*, "Correlative fluorescence and transmission electron microscopy assisted by 3D machine learning reveals thin nanodiamonds fluoresce brighter," *ACS Nano* **17**, 16491–16500 (2023).
233. T.-N. Le, H.-Y. Chen, X. M. Lam, C.-C. Wang, and H.-C. Chang*, "Antibody-conjugated nanodiamonds as dual-functional immunosensors for *in vitro* diagnostics," *Anal. Chem.* **95**, 12080–12088 (2023).
232. C.-S. Huang, C.-H. Hsiao, Y.-C. Chang, C.-H. Chang, J.-C. Yang, J. L. Gutmann, H.-C. Chang, H.-M. Huang*, and S.-C. Hsieh*, "A novel endodontic approach in removing smear layer using nano and submicron diamonds with intracanal oscillation irrigation," *Nanomaterials* **13**, 1646 (2023) (*16pp*).
231. V. Elakkat, E. Tessema, C.-H. Lin, X. Wang*, H.-C. Chang, Y.-N. Zheng, Y.-C. Huang, G. Gurumallappa, Z.-Y. Zhang, K. L. Chan, H. A. Rahayu, J. S. Francisco, and N. Lu*, "Unusual changes of C–H bond lengths in chiral zinc complexes induced by noncovalent interactions," *Angew. Chem. Int. Ed.* **62**, e202215438 (2023) (*8pp*).
230. T.-I. Yang, T. Azuma, Y.-W. Huang, Y.-Y. Hui, C.-T. Chiang, and H.-C. Chang*, "Stimulated emission cross sections and temperature-dependent spectral shifts of neutral nitrogen-vacancy centers in diamonds," *J. Chin. Chem. Soc.* **70**, 451–459 (2023).
229. T.-N. Le, W. W.-W. Hsiao*, Y.-Y. Cheng, C.-C. Lee, T.-T. Huynh, M. D. Pham, M. Chen, M.-W. Jen, H.-C. Chang*, and W.-H. Chiang*, "Spin-enhanced lateral flow immunoassay for high-sensitivity detection of nonstructural protein NS1 serotypes of dengue virus," *Anal. Chem.* **94**, 17819–17826 (2022).
228. T.-I. Yang, Y.-W. Huang, P. Bista, C.-F. Ding, J. Chen, C.-T. Chiang*, and H.-C. Chang*, "Photoluminescence of nitrogen-vacancy centers by ultraviolet one- and two-photon excitation of fluorescent nanodiamonds," *J. Phys. Chem. Lett.* **13**, 11280–11287 (2022).
227. W. W.-W. Hsiao*, N. Sharma, T.-N. Le, Y.-Y. Cheng, C.-C. Lee, D.-T. Vo, Y.-Y. Hui, H.-C. Chang, and W.-H. Chiang*, "Fluorescent nanodiamond-based spin-enhanced lateral flow immunoassay for detection of SARS-CoV-2 nucleocapsid protein and spike protein from different variants," *Anal. Chim. Acta* **1230**, 340389 (2022) (*8pp*).
226. Y. Y. Hui, Y.-X. Tang, T. Azuma, H.-H. Lin, F.-Z. Liao, Q.-Y. Chen, J.-H. Kuo, Y.-L. Wang, and H.-C. Chang*, "Design and implementation of a low-cost portable reader for thermometric lateral flow immunoassay," *J. Chin. Chem. Soc.* **69**, 1356–1365 (2022).
225. T. Azuma, Y. Y. Hui, O. Y. Chen, Y.-L. Wang, and H.-C. Chang*, "Thermometric lateral flow immunoassay with colored latex beads as reporters for COVID-19 testing," *Sci. Rep.* **12**, 3905 (2022) (*12pp*).
224. A. A. Patil, M. J. N. Descanzo, J. B. A. Agcaoili, C.-K. Chiang, C.-L. Cheng, H.-C. Chang, and W.-P. Peng*, "Carboxylated/oxidized diamond nanoparticles for quantifying

immunoglobulin G antibodies using mass spectrometry," *ACS Appl. Nano Mater.* **4**, 8922–8936 (2021).

223. S. Meuret*, L. H.G. Tizei, F. Houdellier, Y. Auad, S. Weber, H.-C. Chang, M. Kociak and A. Arbouet*, "Time-resolved cathodoluminescence in an ultrafast transmission electron microscope," *Appl. Phys. Lett.* **119**, 062106 (2021) (*6pp*).
222. J. Chen*, O. Y. Chen*, and H.-C. Chang*, "Relaxation of a dense ensemble of spins in diamond under a continuous microwave driving field," *Sci. Rep.* **11**, 16278 (2021) (*12pp*).
221. T. T. Ho, V. T. Pham, T. T. Nguyen, T. V. Bao, V. T. Trinh, Q. M. Dang, H.-H. Lin, H. T. Bui, P. T. M. Nguyen, N. B. Pham, T. B. L. Thi, C. V. Phan, H.-C. Chang, W. W.-W. Hsiao, H. H. Chu*, and M. D. Pham*, "Effects of size and surface properties of nanodiamonds on the immunogenicity of recombinant H5 protein of A/H5N1 virus in mice," *Nanomaterials* **11**, 1597 (2021).
220. Y. Y. Hui, O. Y. Chen, H.-H. Lin, Y.-K. Su, K. Chen, C.-Y. Wang, W. W.-W. Hsiao, and H.-C. Chang*, "Magnetically modulated fluorescence of nitrogen-vacancy centers in nanodiamonds for ultrasensitive biomedical analysis," *Anal. Chem.* **93**, 7140–7147 (2021).
219. N. Prabhakar*, I. Belevich, M. Peurla, X. Heiligenstein, H.-C. Chang, C. Sahlgren, E. Jokitalo, and J. M. Rosenholm, "Cell volume (3D) correlative microscopy facilitated by intracellular fluorescent nanodiamonds as multi-modal probes," *Nanomaterials* **11**, 14 (2021) (*10pp*).
218. S. Meuret, Y. Auad, L. Tizei, H.-C. Chang, F. Houdellier, M. Kociak, and A. Arbouet, "Time-resolved cathodoluminescence in a transmission electron microscope applied to NV centers in diamond," *Microsc. Microanal.* **26 (S2)**, 2022-2023 (2020).
217. D. Duan, V. K. Kavatamane, S. R. Arumugam, Y.-K. Tzeng, H.-C. Chang, and G. Balasubramanian*, "Tapered ultra-high NA optical fiber tip for nitrogen-vacancy ensembles based endoscope in a fluidic environment," *Appl. Phys. Lett.* **116**, 113701 (2020) (*6pp*).
216. H.-C. Lu*, J.-I. Lo, Y.-C. Peng, S.-L. Chou, B.-M. Cheng*, and H.-C. Chang*, "Nitrogen-vacancy centers in diamond for high-performance detection of vacuum ultraviolet, extreme ultraviolet and X-rays," *ACS Appl. Mater. Interfaces* **12**, 3847−3853 (2020).
215. S.-J. Kuo, S.-W. Chang, Y. Y. Hui, O. Y. Chen, Y.-W. Chen, C.-C. Lin, D. Wan, H.-L. Chen*, and H.-C. Chang*, "Fluorescent microdiamonds conjugated with hollow gold nanoparticles as photothermal fiducial markers in tissue," *J. Mater. Chem. C* **7**, 15197−15207 (2019).
214. B.-M. Chang, L. Pan, H.-H. Lin, and H.-C. Chang*, "Nanodiamond-supported silver nanoparticles as potent and safe antibacterial agents," *Sci. Rep.* **9**, 13164 (2019) (*11pp*).
213. Y. Xu, Y. Su, Y. Yu, Y. Y. Hui, J. Cheng, H.-C. Chang, Y. Zhang, Y. R. Shen, and C. Tian*, "Mapping dynamical magnetic responses of ultra-thin micro-size superconducting films using nitrogen-vacancy centers in diamond," *Nano Lett.* **19**, 5697−5702 (2019).
212. L.-J. Su, H.-H. Lin, M.-H. Wu, L. Pan, K. Yadav, H.-H. Hsu, T.-Y. Ling, Y.-T. Chen, and H.-C. Chang*, "Intracellular delivery of luciferase with fluorescent nanodiamonds for dual-modality imaging of human stem cells," *Bioconjugate Chem.* **30**, 2228−2237 (2019).
211. Y. Y. Hui, O. Y. Chen, T. Azuma, B.-M. Chang, F.-J. Hsieh, and H.-C. Chang*, "All-optical thermometry with nitrogen-vacancy centers in nanodiamond-embedded polymer films," *J. Phys. Chem. C* **123**, 15366−15374 (2019).
210. F.-J. Hsieh, S. Sotoma, H.-H. Lin, C.-Y. Cheng, T.-Y. Yu, C.-L. Hsieh, C.-H. Lin*, and H.-C. Chang*, "Bioorthogonal fluorescent nanodiamonds for continuous long-term imaging and tracking of membrane proteins," *ACS Appl. Mater. Interfaces* **11**, 19774–19781 (2019).
209. D. Duan, V. K. Kavatamane, S. R. Arumugam, G. Rahane, G. Du, Y.-K. Tzeng, H.-C. Chang, and G. Balasubramanian*, "Laser induced heating in a high-density ensemble of

nitrogen-vacancy centers in diamond and its effects on quantum sensing," *Opt. Lett.* **44**, 2851–2854 (2019).

208. F.-J. Hsieh, Y.-W. Chen, Y. Y. Hui, C.-H. Lin, and H.-C. Chang*, "Quantification and imaging of antigens on cell surface with lipid-encapsulated fluorescent nanodiamonds," *Micromachines* **10**, 304 (2019) (*10pp*).
207. D. Duan, G. Du, V. K. Kavatamane, G. Rahane, S. R. Arumugam, Y.-K. Tzeng, H.-C. Chang, and G. Balasubramanian*, "Efficient nitrogen-vacancy centers' fluorescence excitation and collection from micrometer-sized diamond by a tapered optical fiber in endoscope-type configuration," *Opt. Express* **27**, 6734–6745 (2019).
206. S.-Y. Liang, A. A. Patil, C.-H. Han, S.-W. Chou, W. Chang, P.-C. Soo, H.-C. Chang, and W.-P. Peng*, "Ionization of submicron-sized particles by laser-induced RF plasma for mass spectrometric analysis," *Anal. Chem.* **90**, 13236–13242 (2018).
205. S.-J. Kuo, P.-C. Tsai, Y.-C. Lee, S.-W. Chang, S. Sotoma, C.-Y. Fang, H.-C. Chang, and H.-L. Chen*, "Manipulating the distribution of electric field intensity to effectively enhance the spatial and spectral fluorescence intensity of fluorescent nanodiamonds," *Nanoscale* **10**, 17576–17584 (2018).
204. S. Sotoma*, F.-J. Hsieh, and H.-C. Chang*, "Single-step metal-free grafting of cationic polymer brushes on fluorescent nanodiamonds," *Materials* **11**, 1479 (2018) (*9pp*).
203. D. Duan, V. K. Kavatamane, S. R. Arumugam, G. Rahane, Y.-K. Tzeng, H.-C. Chang, H. Sumiya, S. Onoda, J. Isoya, and G. Balasubramanian*, "Enhancing fluorescence excitation and collection from the nitrogen-vacancy center in diamond through a micro-concave mirror," *Appl. Phys. Lett.* **113**, 041107 (2018) (*5pp*).
202. P. R. Dolan, S. Adekanye, A. A. P. Trichet, S. Johnson, L. Flatten, Y. C. Chen, L. Weng, D. Hunger, H.-C. Chang, S. Castelletto, and J. M. Smith*, "Robust, tunable, and high purity triggered single photon source at room temperature using a nitrogen-vacancy defect in diamond in an open microcavity," *Opt. Express* **26**, 7056–7065 (2018).
201. J. Zhao, Y. Cheng, H. Shen, Y. Y. Hui, T. Wen, H.-C. Chang, Q. Gong, and G. Lu*, "Light emission from plasmonic nanostructures enhanced with fluorescent nanodiamonds," *Sci. Rep.* **8**, 3605 (2018) (*8pp*).
200. H. Lourenco-Martins, M. Kociak, S. Meuret, F. Treussart, Y. H. Lee, X. Y. Ling, H.-C. Chang, and L. H. G. Tizei*, "Probing plasmon-NV^0 coupling at the nanometer scale with photons and fast electrons," *ACS Photonics* **5**, 324–328 (2018).
199. S. Sotoma*, F.-J. Hsieh, Y.-W. Chen, P.-C. Tsai, and H.-C. Chang*, "Highly stable lipid-encapsulation of fluorescent nanodiamonds for bioimaging applications," *Chem. Commun.* **54**, 1000–1003 (2018).
198. F.-J. Hsieh, Y.-W. Chen, Y.-K. Huang, H.-M. Lee, C.-H. Lin, and H.-C. Chang*, "Correlative light-electron microscopy of lipid-encapsulated fluorescent nanodiamonds for nanometric localization of cell surface antigens," *Anal. Chem.* **90**, 1566–1571 (2018).
197. N. Prabhakar, M. Peurla, S. Koho, T. Deguchi, T. Näreoja, H.-C. Chang, J. M. Rosenholm*, and P. E. Hänninen, "STED-TEM correlative microscopy leveraging nanodiamonds as intracellular dual-contrast markers," *Small* **14**, 1701807 (2018) (*7pp*).
196. H.-C. Lu*, Y.-C. Peng, S.-L. Chou, J.-I. Lo, B.-M. Cheng*, and H.-C. Chang*, "Far-UV excited luminescence of nitrogen-vacancy centers: Evidence for diamonds in space," *Angew. Chem. Int. Ed.* **56**, 14469–14473 (2017).
195. N. B. Pham, T. T. Ho, G. T. Nguyen, T. T. Le, N. T. Le, H.-C. Chang, M. D. Pham, U. Conrad, and H. H. Chu*, "Nanodiamond enhances immune responses in mice against recombinant HA/H7N9 protein," *J. Nanobiotechnol.* **15**, 69 (2017) (*12pp*).
194. V. I. Korepanov, H. Hamaguchi*, E. Osawa, V. Ermolenkov, I. Lednev, B. J. M. Etzold, O. Levinson, B. Zousman, C. P. Epperla, and H.-C. Chang, "Carbon structure in nanodiamonds elucidated from Raman spectroscopy," *Carbon* **121**, 322–329 (2017).
193. Y.-W. Chen, C.-H. Lee, Y.-L. Wang, T.-L. Li, and H.-C. Chang*, "Nanodiamonds as nucleating agents for protein crystallization," *Langmuir* **33**, 6521–6527 (2017).

192. N. Prabhakar, M. H. Khan, M. Peurla, H.-C. Chang, P. E. Hänninen, and J. M. Rosenholm*, "Intracellular trafficking of fluorescent nanodiamonds and regulation of their cellular toxicity," *ACS Omega* **2**, 2689–2693 (2017).
191. M. D. Pham, C. P. Epperla, C.-L. Hsieh, W. Chang, and H.-C. Chang*, "Glycosaminoglycans-specific cell targeting and imaging using fluorescent nanodiamonds coated with viral envelope proteins," *Anal. Chem.* **89**, 6527–6534 (2017).
190. S. Haziza*, N. Mohan, Y. Loe-Mie, A.-M. Lepagnol-Bestel, S. Massou, M.-P. Adam, X. L. Le, J. Viard, C. Plancon, R. Daudin, P. Koebel, E. Dorard, C. Rose, F.-J. Hsieh, C.-C. Wu, B. Potier, Y. Herault, C. Sala, A. Corvin, B. Allinquant, H.-C. Chang, F. Treussart*, and M. Simonneau*, "Fluorescent nanodiamond tracking reveals intraneuronal transport abnormalities induced by brain disease-related genetic risk factors," *Nat. Nanotechnol.* **12**, 322–328 (2017).
189. L.-J. Su, M.-S. Wu, Y. Y. Hui, B.-M. Chang, L. Pan, P.-C. Hsu, Y.-T. Chen, H.-N. Ho, Y.-H. Huang, T.-Y. Ling*, H.-H. Hsu*, and H.-C. Chang*, "Fluorescent nanodiamonds enable quantitative tracking of human mesenchymal stem cells in miniature pigs," *Sci. Rep.* **7**, *45607* (2017) (*11pp*).
188. P.-C. Tsai, C. P. Epperla, J.-S. Huang, O. Y. Chen, C.-C. Wu, and H.-C. Chang*, "Measuring nanoscale thermostability of cell membranes with single gold-diamond nanohybrids," *Angew. Chem. Int. Ed.* **56**, 3025–3030 (2017).
187. K.-K. Liu, W.-R. Qiu, E. N. Raj, H.-F. Liu, H.-S. Huang, Y.-W. Lin, C.-J. Chang, T.-H. Chen, C. Chen, H.-C. Chang, J.-K. Hwang, and J.-I. Chao*, "Ubiquitin-coated nanodiamonds bind to autophagy receptors for entry into the selective autophagy pathway," *Autophagy* **13**, 187–200 (2017).
186. C. Xiong, X. Zhou, Q. He, X. Huang, J. Wang, W.-P. Peng, H.-C. Chang, and Z. Nie*, "The development of visible-wavelength MALDI cell mass spectrometry (CMS) for high-efficiency single-cell analysis," *Anal. Chem.* **88**, 11913–11918 (2016).
185. H. Kaupp, T. Hümmer, B. Schlederer, H.-C. Chang, H. Fedder, R. Reuter, T. W. Hänsch, and D. Hunger*, "Purcell-enhanced single-photon emission from nitrogen-vacancy centers coupled to a tunable microcavity," *Phys. Rev. Appl.* **6**, 054010 (2016).
184. C. H. Nee, S. L. Yap, T. Y. Tou, H.-C. Chang, and S.-S. Yap*, "Direct synthesis of nanodiamonds by femtosecond laser irradiation of ethanol," *Sci. Rep.* **6**, 33966 (2016) (*8pp*).
183. H. Shen, R. Y. Chou, Y. Y. Hui, Y. He, Y. Cheng, H.-C. Chang, L. Tong, Q. Gong, and G. Lu*, "Directional fluorescence emission from a compact plasmonic-diamond hybrid nanostructure," *Laser Photon. Rev.* **10**, 647–655 (2016).
182. N. Zhang, K. Zhu, C. Xiong, Y. Jiang, H.-C. Chang, and Z. Nie*, "Mass measurement of single intact nanoparticles in a cylindrical ion trap," *Anal. Chem.* **88**, 5958–5962 (2016).
181. S. Nagarajan, C. Pioche-Durieu, L. H. G. Tizei, C.-Y. Fang, J.-R. Bertrand, E. Le Cam, H.-C. Chang, F. Treussart*, and M. Kociak*, "Simultaneous cathodoluminescence and electron microscopy cytometry of cellular vesicles labeled with fluorescent nanodiamonds," *Nanoscale* **8**, 11588–11594 (2016).
180. M. D. Pham, T.-C. Wen, H.-C. Li, P.-H. Hsieh, Y.-R. Chen, H.-C. Chang*, and C.-C. Han*, "Streamlined membrane proteome preparation for shotgun proteomics analysis with Triton X-100 cloud point extraction and nanodiamond solid phase extraction," *Materials* **9**, 385 (2016) (*17pp*).
179. M. K. Pola, M. V. R. Raju, C.-M. Lin, R. Putikam, M.-C. Lin, C. P. Epperla, H.-C. Chang, S.-Y. Chen, and H.-C. Lin*, "A fully-aqueous red-fluorescent probe for selective optical sensing of Hg^{2+} and its application in living cells," *Dyes Pigments* **130**, 256–265 (2016).
178. C. P. Epperla, O. Y. Chen, and H.-C. Chang*, "Gold/diamond nanohybrids may reveal how hyperlocalized hyperthermia kills cancer cells," *Nanomedicine* **11**, 443–445 (2016).
177. B. Yang, C.-Y. Fang, H.-C. Chang, F. Treussart, J.-B. Trebbia, and B. Lounis*, "Polarization effects in lattice-STED microscopy," *Faraday Discuss.* **184**, 37–49 (2015).

176. C. P. Epperla, N. Mohan, C.-W. Chang, C.-C. Chen, and H.-C. Chang*, "Nanodiamond-mediated intercellular transport of proteins through membrane tunneling nanotubes," *Small* **11**, 6097–6105 (2015).
175. K.-H. Chen, D. J. Lundy, E. K.W. Toh, C.-H. Chen, P. Chen, H.-C. Chang, J. J. Lai, P. S. Stayton, A. S. Hoffman, and P. C. H. Hsieh*, "Nanoparticle distribution during systemic inflammation is size-dependent and organ-specific," *Nanoscale* **7**, 15863–15872 (2015).
174. H.-H. Lin, H.-W. Lee, R.-J. Lin, C.-W. Huang, Y.-C. Liao, J.-M. Fang, Y.-T. Chen, T.-C. Lee, A. L. Yu*, and H.-C. Chang*, "Tracking and finding slow-proliferating/quiescent cancer stem cells with fluorescent nanodiamonds," *Small* **11**, 4394–4402 (2015).
173. P.-C. Tsai, O. Y. Chen, Y.-K. Tzeng, Y. Y. Hui, J. Y. Guo, C.-C. Wu, M.-S. Chang*, and H.-C. Chang*, "Gold/diamond nanohybrids for quantum sensing applications," *EPJ Quantum Technol.* **2**, 19 (2015) (*12pp*).
172. C.-L. Lin, C.-H. Lin, H.-C. Chang*, and M.-C. Su*, "Protein attachment on nanodiamonds," *J. Phys. Chem. A* **119**, 7704–7711 (2015).
171. Z. Chu, K. Miu, P. Lung, S. Zhang, S. Zhao, H.-C. Chang, G. Lin, and Q. Li*, "Rapid endosomal escape of prickly nanodiamonds: implications for gene delivery," *Sci. Rep.* **5**, 11661 (2015) (*8pp*).
170. Y.-K. Tzeng, P.-C. Tsai, H.-Y. Liu, O. Y. Chen, H. Hsu, F.-G. Yee, M.-S. Chang*, and H.-C. Chang*, "Time-resolved luminescence nanothermometry with nitrogen-vacancy centers in nanodiamonds," *Nano Lett.* **15**, 3945–3952 (2015).
169. T. Plakhotnik*, H. Aman, and H.-C. Chang, "All-optical single-nanoparticle ratiometric thermometry with a noise floor of 0.3 $K \cdot Hz^{-1/2}$," *Nanotechnology* **26**, 245501 (2015) (*7pp*).
168. R. Silbajoris, W. Linak, O. Shenderova, C. Winterrowd, H.-C. Chang, J. L. Zweier, A. Kota, L. A. Dailey, P. A. Bromberg, and J. M. Samet*, "Detonation nanodiamond toxicity in human airway epithelial cells is modulated by air oxidation," *Diamond Relat. Mater.* **58**, 16–23 (2015).
167. S. Meuret, L. H. G. Tizei, T. Cazimajou, R. Bourrellier, H.-C. Chang, F. Treussart, and M. Kociak*, "Photon bunching in cathodoluminescence," *Phys. Rev. Lett.* **114**, 197401 (2015) (*5pp*).
166. T. Zhang, H. Cui, C.-Y. Fang, K. Cheng, X. Yang, H.-C. Chang, and M. L. Forrest*, "Targeted nanodiamonds as phenotype-specific photoacoustic contrast agents for breast cancer," *Nanomedicine* **10**, 573–587 (2015).
165. A. Singh, R. Singh, M. Shellaiah, E. C. Prakash, H.-C. Chang, P. Raghunath, M.-C. Lin, and H.-C. Lin*, "A new pyrene-based aggregation induced ratiometric emission probe for selective detections of trivalent metal ions and its living cell application," *Sensor. Actuat. B-Chem.* **207**, 338–345 (2015).
164. C.-Y. Fang, C.-C. Chang, C.-Y. Mou, and H.-C. Chang*, "Preparation and characterization of ion-irradiated nanodiamonds as photoacoustic contrast agents," *J. Nanosci. Nanotech.* **15**, 1037−1044 (2015).
163. Y.-A. Huang, C.-W. Kao, K.-K. Liu, H.-S. Huang, M.-H. Chiang, C.-R. Soo, H.-C. Chang, T.-W. Chiu*, J.-I. Chao*, and E. Hwang*, "The effect of fluorescent nanodiamonds on neuronal survival and morphogenesis," *Sci. Rep.* **4**, 6919 (2014) (*10pp*).
162. M. Kayci, H.-C. Chang, and A. Radenovic*, "Electron spin resonance of nitrogen-vacancy defects embedded in single nanodiamonds in an ABEL trap," *Nano Lett.* **14**, 5335–5341 (2014).
161. Y. Y. Hui, L.-J. Su, O. Y. Chen, Y.-T. Chen, T.-M. Liu, and H.-C. Chang*, "Wide-field imaging and flow cytometric analysis of cancer cells in blood by fluorescent nanodiamond labeling and time gating," *Sci. Rep.* **4**, 5574 (2014) (*7pp*).
160. T.-R. Kuo, W.-Y. Lai, C.-H. Li, Y.-Z. Wen, H.-C. Chang, J.-S. Chen, P.-C. Yang, and C.-C. Chen*, "AS1411 aptamer-conjugated Gd_2O_3:Eu nanoparticles for target-specific

computed tomography/magnetic resonance/fluorescence molecular imaging," *Nano Res.* **7**, 658−669 (2014).

159. T.-C. Hsu, K.-K. Liu, H.-C. Chang, E. Hwang, and J.-I. Chao*, "Labeling of neuronal differentiation and neuron cells with biocompatible fluorescent nanodiamonds," *Sci. Rep.* **4**, 5004 (2014) (*11pp*).
158. C. Xiong, X. Zhou, N. Zhang, L. Zhan, S. Chen, W.-P. Peng, H.-C. Chang, and Z. Nie*, "Quantitative assessment of protein adsorption on microparticles with particle mass spectrometry," *Anal. Chem.* **86**, 3876–3881 (2014).
157. Z. Chu, S. Zhang, B. Zhang, C. Zhang, C.-Y. Fang, I. Rehor, P. Cigler, H.-C. Chang, G. Lin, R. Liu, and Q. Li*, "Unambiguous observation of shape effects on cellular fate of nanoparticles," *Sci. Rep.* **4**, *4495* (2014) (*9pp*).
156. Y. Nawa, W. Inami, S. Lin, Y. Kawata*, S. Terakawa, C.-Y. Fang, and H.-C. Chang, "Multi-color imaging of fluorescent nanodiamonds in living HeLa cells using direct electron-beam excitation," *ChemPhysChem* **15**, *721–726* (2014).
155. X. Yang, Y.-K. Tzeng, Z. Zhu, Z. Huang, X. Chen, Y. Liu, H.-C. Chang, L. Huang*, W.-D. Li*, and P. Xi*, "Sub-diffraction imaging of nitrogen-vacancy centers in diamond by stimulated emission depletion and structured illumination," *RSC Adv.* **4**, 11305–11310 (2014).
154. M. V. R. Raju, E. C. Prakash, H.-C. Chang, and H.-C. Lin*, "A facile ratiometric fluorescent chemodosimeter for hydrazine based on Ing-Manske hydrazinolysis and its applications in living cells," *Dyes Pigments* **103**, 9–20 (2014).
153. T.-R. Kuo, D.-Y. Wang, Y.-C. Chiu, Y.-C. Yeh, W.-T. Chen, C.-H. Chen, C.-W. Chen, H.-C. Chang, C.-C. Hu, and C.-C. Chen*, "Layer-by-layer thin film of reduced graphene oxide and gold nanoparticles as an effective sample plate in laser-induced desorption/ionization mass spectrometry," *Anal. Chim. Acta* **809**, 97–103 (2014).
152. L. H. G. Tizei, S. Meuret, S. Nagarajan, F. Treussart, C.-Y. Fang, H.-C. Chang, and M. Kociak*, "Spatially and spectrally resolved cathodoluminescence with fast electrons: A tool for background subtraction in luminescence intensity second-order correlation measurements applied to subwavelength inhomogeneous diamond nanocrystals," *Phys. Status Solidi A* **210**, 2060–2065 (2013).
151. B.-M. Chang, H.-H. Lin, L.-J. Su, W.-D. Lin, R.-J. Lin, Y.-K. Tzeng, R. T. Lee, Y. C. Lee, A. L. Yu*, and H.-C. Chang*, "Highly fluorescent nanodiamonds protein-functionalized for cell labeling and targeting," *Adv. Funct. Mater.* **23**, *5737–5745* (2013).
150. H. Kaupp, C. Deutsch, H.-C. Chang, J. Reichel, T. W. Hänsch, and D. Hunger*, "Scaling laws of the cavity enhancement for nitrogen-vacancy centers in diamond," *Phys. Rev. A* **88**, 053812 (2013) (*8pp*).
149. H.-C. Li, F.-J. Hsieh, C.-P. Chen, M.-Y. Chang, P. C. H. Hsieh, C.-C. Chen, S.-U. Hung, C.-C. Wu, and H.-C. Chang*, "The hemocompatibility of oxidized diamond nanocrystals for biomedical applications," *Sci. Rep.* **3**, 3044 (2013) (*8pp*).
148. T.-J. Wu, Y.-K. Tzeng, W.-W. Chang, C.-A. Cheng, Y. Kuo, C.-H. Chien, H.-C. Chang*, and J. Yu*, "Tracking the engraftment and regenerative capabilities of transplanted lung stem cells using fluorescent nanodiamonds," *Nat. Nanotechnol.* **8**, 682–689 (2013).
147. Y. Kuo, T.-Y. Hsu, Y.-C. Wu*, and H.-C. Chang*, "Fluorescent nanodiamond as a probe for the intercellular transport of proteins *in vivo*," *Biomaterials* **34**, 8352–8360 (2013).
146. L.-J. Su, C.-Y. Fang, Y.-T. Chang, K.-M. Chen, Y.-C. Yu, J.-H. Hsu*, and H.-C. Chang*, "Creation of high density ensembles of nitrogen-vacancy centers in nitrogen-rich type Ib nanodiamonds," *Nanotechnology* **24**, 315702 (2013) (*9pp*).
145. A. Ermakova, G. Pramanik, J.-M. Cai, G. Algara-Siller, U. Kaiser, T. Weil, Y.-K. Tzeng, H.-C. Chang, L. P. McGuinness, M. B. Plenio, B. Naydenov*, and F. Jelezko, "Detection of a few metallo-protein molecules using color centers in nanodiamonds," *Nano Lett.* ***13***, 3305–3309 (2013).

144. C. Xiong, X. Zhou, J. Wang, N. Zhang, W.-P. Peng, H.-C. Chang, and Z. Nie*, "Ambient aerodynamic desorption/ionization method for microparticle mass measurement," *Anal. Chem.* **85**, 4370−4375 (2013).
143. C.-C. Hsieh, J. Y. Guo, S.-U. Hung, R. Chen, Z. Nie, H.-C. Chang, and C.-C. Wu*, "Quantitative analysis of oligosaccharides derived from sulfated glycosaminoglycans by nanodiamond-based affinity purification and MALDI MS," *Anal. Chem.* **85**, 4342–4349 (2013).
142. N. D. Lai*, O. Faklaris, D. Zheng, V. Jacques, H.-C. Chang, J.-F. Roch, and F. Treussart*, "Quenching nitrogen-vacancy center photoluminescence with infrared pulsed laser," *New J. Phys.* **15**, 033030 (2013) (*14pp*).
141. T. Zhang, H. Cui, C.-Y. Fang, L.-J. Su, S. Ren, H.-C. Chang, X. Yang, and M. L. Forrest*, "Photoacoustic contrast imaging of biological tissues with nanodiamonds fabricated for high near-infrared absorbance," *J. Biomed. Opt.* **18**, 026018 (2013) (*6pp*).
140. C. M. T. Campbell, M. T. Fontana, B. C. Taggart, M.-C. Su*, C.-L. Lin, H.-C. Chang, and H.-J. Chen, "Acid denaturation and refolding of cytochrome c on silica surface," *J. Chin. Chem. Soc.* **60**, 140–152 (2013).
139. Y. Y. Hui, Y.-C. Lu, L.-J. Su, C.-Y. Fang, J.-H. Hsu, and H.-C. Chang*, "Tip-enhanced sub-diffraction fluorescence imaging of nitrogen-vacancy centers in nanodiamonds," *Appl. Phys. Lett.* **102**, 013102 (2013) (*4pp*).
138. S.-W. Chou, G.-R. Shiu, H.-C. Chang, and W.-P. Peng*, "Wavelet-based method for time-domain noise analysis and reduction in a frequency-scan quadrupole ion trap mass spectrometer," *J. Am. Soc. Mass Spectrom.* **23**, 1855–1864 (2012).
137. V. Vaijayanthimala, P.-Y. Cheng, S.-H. Yeh, K.-K. Liu, C.-H. Hsiao*, J.-I. Chao*, and H.-C. Chang*, "The long-term stability and biocompatibility of fluorescent nanodiamond as an *in vivo* contrast agent," *Biomaterials* **33**, 7794–7802 (2012).
136. L.-H. Chen, T.-S. Lim*, and H.-C. Chang, "Measuring the number of $(N\text{-}V)^-$ centers in single fluorescent nanodiamonds in the presence of quenching effects," *J. Opt. Soc. Am. B* **29**, 2309–2313 (2012).
135. B. Zhang, C.-Y. Fang, C.-C. Chang, R. Peterson, S. Maswadi, R. D. Glickman, H.-C. Chang, and J. Y. Ye*, "Photoacoustic emission from fluorescent nanodiamonds enhanced with gold nanoparticles," *Biomed. Opt. Express* **3**, 1662–1669 (2012).
134. R. Chen, C. Xiong, X. Zhou, C.-C. Wu*, X. Ding, Z. Nie*, and H.-C. Chang, "N-(1-naphthyl) ethylenediamine dinitrate: A new matrix for negative ion MALDI-TOF MS analysis of small molecules," *J. Am. Soc. Mass Spectrom.* **23**, 1454–1460 (2012).
133. X. Y. Zhou, C. Q. Xiong, J. N. Wang, R. Chen, Y. Tang, H. X. Qiao, W.-P. Peng, H.-C. Chang, and Z. X. Nie*, "The development of charge detection quadrupole ion trap mass spectrometry (CD-ITMS) driven by rectangular and triangular waves," *Analyst* **137**, 1199–1204 (2012).
132. R. Chen, W. J. Xu, C. Q. Xiong, X. Y. Zhou, S. X. Xiong, Z. X. Nie*, L. Q. Mao, and H.-C. Chang*, "High-salt-tolerance matrix for facile detection of glucose in rat brain microdialysates by MALDI mass spectrometry," *Anal. Chem.* **84**, 465–469 (2012).
131. C.-Y. Fang, V. Vaijayanthimala, C.-A. Cheng, S.-H. Yeh, C.-F. Chang, C.-L. Li, and H.-C. Chang*, "The exocytosis of fluorescent nanodiamond and its use as a long-term cell tracker," *Small* **7**, 3363–3370 (2011).
130. C. Q. Xiong, X. Y. Zhou, R. Chen, Y. M. Zhang, W.-P. Peng, Z. X. Nie*, H.-C. Chang, H. W. Liu*, and Y. Chen, "Characterization of column packing materials in high-performance liquid chromatography by charge-detection quadrupole ion trap mass spectrometry," *Anal. Chem.* **83**, 5400–5406 (2011).
129. M. Yamanaka, Y.-K. Tzeng, S. Kawano, N. I. Smith, S. Kawata, H.-C. Chang, and K. Fujita*, "SAX microscopy with fluorescent nanodiamond probes for high-resolution fluorescence imaging," *Biomed. Opt. Express* **2**, 1946–1954 (2011).

128. J.-H. Hsu*, W.-D. Su, K.-L. Yang, Y.-K. Tzeng, and H.-C. Chang, "Non-blinking green emission from single H3 color centers in nanodiamonds," *Appl. Phys. Lett.* **98**, 193116 (2011) (3*pp*).
127. Y.-Y. Chen, H. Shu, Y. Kuo, Y.-K. Tzeng, and H.-C. Chang*, "Measuring Förster resonance energy transfer between fluorescent nanodiamonds and near-infrared dyes by acceptor photobleaching," *Diamond Relat. Mater.* **20**, 803–807 (2011).
126. Y. Y. Hui*, Y.-R. Chang, N. Mohan, T.-S. Lim, Y.-Y. Chen, and H.-C. Chang*, "Polarization modulation spectroscopy of single fluorescent nanodiamonds with multiple nitrogen-vacancy centers," *J. Phys. Chem. A* ***115***, 1878–1884 (2011).
125. Y.-K. Tzeng, O. Faklaris, B.-M. Chang, Y. Kuo, J.-H. Hsu, and H.-C. Chang*, "Superresolution imaging of albumin-conjugated fluorescent nanodiamonds in cells by stimulated emission depletion," *Angew. Chem. Int. Ed.* **50**, 2262–2265 (2011).
124. L. Rondin, G. Dantelle*, A. Slablab, F. Treussart, P. Bergonzo, S. Perruchas, T. Gacoin, H.-C. Chang, V. Jacques*, and J.-F. Roch, "Surface-induced charge state conversion of nitrogen-vacancy defects in nanodiamonds," *Phys. Rev. B* **82**, 115449 (2010) (5*pp*).
123. N. Mohan, C.-S. Chen, H.-H. Hsieh, Y.-C. Wu*, and H.-C. Chang*, "*In vivo* imaging and toxicity assessments of fluorescent nanodiamonds in *Caenorhabditis elegans*," *Nano Lett.* **10**, 3692–3699 (2010).
122. Y.-C. Chang, C.-N. Huang, C.-H. Lin, H.-C. Chang, and C.-C. Wu*, "Mapping protein cysteine sulfonic acid modifications with specific enrichment and mass spectrometry: An integrated approach to explore the cysteine oxidation," *Proteomics* **10**, 2961−2971 (2010).
121. Y. Y. Hui, B. Zhang, Y.-C. Chang, C.-C. Chang, H.-C. Chang*, J.-H. Hsu, K. Chang, and F.-H. Chang, "Two-photon fluorescence correlation spectroscopy of lipid-encapsulated fluorescent nanodiamonds in living cells," *Opt. Express* **18**, 5896–5905 (2010).
120. N. Mohan, Y.-K. Tzeng, L. Yang, Y.-Y. Chen, Y. Y. Hui, C.-Y. Fang, and H.-C. Chang*, "Sub-20-nm fluorescent nanodiamonds as photostable biolabels and fluorescence resonance energy transfer donors," *Adv. Mater.* **22**, 843–847 (2010).
119. B. Zhang, Y. Li, C.-Y. Fang, C.-C. Chang, C.-S. Chen, Y.-Y. Chen, and H.-C. Chang*, "Receptor-mediated cellular uptake of folate-conjugated fluorescent nanodiamonds: A combined ensemble and single-particle study," *Small* **5**, **2716–2721** (2009).
118. X. L. Kong, C. Lin, G. Infusini, H.-B. Oh, H. Jiang, K. Breuker, C.-C. Wu, O. P. Charkin, H.-C. Chang, and F. W. McLafferty*, "Numerous isomers of serine octamer ions characterized by infrared photodissociation spectroscopy," *ChemPhysChem* 10, 2603–2606 (2009).
117. V. Vaijayanthimala, Y.-K. Tzeng, H.-C. Chang*, and C.-L. Li*, "The biocompatibility of fluorescent nanodiamonds and their mechanism of cellular uptake," *Nanotechnology* **20**, 425103 (2009) (9*pp*).
116. A. Zyubin, A. M. Mebel*, M. Hayashi, H.-C. Chang, and S.-H. Lin, "Quantum chemical modeling of photoabsorption properties of the two- and three-nitrogen-vacancy point defects in diamond," *J. Phys. Chem.* C 113, 10432–10440 (2009).
115. C.-K. Lin*, H.-C. Chang, M. Hayashi, and S. H. Lin, "Excitation properties of the H3 defect center in diamond: A theoretical study," *Chem. Phys. Lett. 475*, 68–72 (2009).
114. Y.-K. Tzeng, Z. Zhu, and H.-C. Chang*, "Alkali-hydroxide-doped matrices for structural characterization of neutral underivatized oligosaccharides by MALDI time-of-flight mass spectrometry," *J. Mass Spectrom.* **44**, 375–383 (2009).
113. T.-S. Lim, C.-C. Fu, K.-C. Lee, H.-Y. Lee, K. Chen, W.-F. Cheng, W. W. Pai, H.-C. Chang*, and W. Fann, "Fluorescence enhancement and lifetime modification of single nanodiamonds near a nanocrystalline silver surface," *Phys. Chem. Chem. Phys.* **11**, 1508–1514 (2009).
112. T.-L. Wee, Y.-W. Mau, C.-Y. Fang, H.-L. Hsu, C.-C. Han, and H.-C. Chang*, "Preparation and characterization of green fluorescent nanodiamonds for biological applications," *Diamond Relat. Mater.* **18**, 567–573 (2009).

111. A. S. Zyubin, A. M. Mebel*, M. Hayashi, H.-C. Chang, and S. H. Lin, "Quantum chemical modeling of photoabsorption properties of the nitrogen-vacancy point defect in diamond," *J. Comput. Chem.* **30**, 119–131 (2009).
110. Y. Y. Hui*, Y.-R. Chang*, T.-S. Lim, H.-Y. Lee, W. Fann, and H.-C. Chang*, "Quantifying the number of color centers in single fluorescent nanodiamonds by photon correlation spectroscopy and Monte Carlo simulation," *Appl. Phys. Lett.* **94**, 013104 (2009) (3pp).
109. A. S. Zyubin, A. M. Mebel*, H.-C. Chang, and S. H. Lin, "Potential energy surfaces for the lowest excited states of the nitrogen-vacancy point defects in diamonds: A quantum chemical study," *Chem. Phys. Lett.* **462**, 251–255 (2008).
108. C.-K. Lin*, Y.-H. Wang, H.-C. Chang, and S. H. Lin, "One- and two-photon absorption properties of diamond nitrogen-vacancy defect centers: A theoretical study," *J. Chem. Phys.* **129**, 124714 (2008).
107. Y.-K. Tzeng, C.-C. Chang, C.-N. Huang, C.-C. Wu, C.-C. Han, and H.-C. Chang*, "Facile MALDI-MS analysis of neutral glycans in NaOH-doped matrices: Microwave-assisted deglycosylation and one-step purification with diamond nanoparticles," *Anal. Chem.* **80**, 6809–6814 (2008).
106. C.-K. Chang, C.-C. Wu*, Y.-S. Wang, and H.-C. Chang, "Selective extraction and enrichment of multi-phosphorylated peptides using polyarginine-coated diamond nanoparticles," *Anal. Chem.* **80**, 3791–3797 (2008).
105. Y.-R. Chang, H.-Y. Lee, K. Chen, C.-C. Chang, D.-S. Tsai, C.-C. Fu, T.-S. Lim, Y.-K. Tzeng, C.-Y. Fang, C.-C. Han, H.-C. Chang*, and W. Fann*, "Mass production and dynamic imaging of fluorescent nanodiamonds," *Nat. Nanotechnol.* **3**, 284–288 (2008).
104. W.-P. Peng, H.-C. Lin, M. Chu, H.-C. Chang, H.-H. Lin, A. L. Yu, and C.-H. Chen*, "Charge monitoring cell mass spectrometry," *Anal. Chem.* **80**, 2524–2530 (2008).
103. Z. X. Nie, F. P. Cui, M. Chu, C.-H. Chen, H.-C. Chang*, and Y. Cai*, "Calibration of a frequency-scan quadrupole ion trap mass spectrometer for microparticle mass analysis," *Int. J. Mass Spectrom.* **270**, 8–15 (2008).
102. Z. X. Nie, F. P. Cui, Y.-K. Tzeng, H.-C. Chang*, M. Chu, H.-C. Lin, C.-H. Chen, H.-H. Lin, and A. L. Yu, "High-speed mass analysis of whole erythrocytes by charge detection quadrupole ion trap mass spectrometry," *Anal. Chem.* **79**, 7401–7407 (2007).
101. C. M. Kraning, T. L. Benz, K. S. Bloome, G. C. Campanello, V. S. Fahrenbach, S. A. Mistry, C. A. Hedge, K. D. Clevenger, K. M. Gligorich, T. A. Hopkins*, G. C. Hoops*, S. B. Mendes, H.-C. Chang, and M.-C. Su*, "Determination of surface coverage and orientation of reduced cytochrome c on a silica surface with polarized ATR spectroscopy," *J. Phys. Chem. C* **111**, 13062–13067 (2007).
100. T.-L. Wee, Y.-K. Tzeng, C.-C. Han, H.-C. Chang*, W. Fann, J.-H. Hsu*, K.-M. Chen, and Y.-C. Yu, "Two-photon excited fluorescence of nitrogen-vacancy centers in proton-irradiated type Ib diamond," *J. Phys. Chem. A* **111**, 9379–9386 (2007).
99. C.-K. Lin*, H.-C. Chang, and S. H. Lin, "Symmetric double-well potential model and its application to vibronic spectra: Studies of inversion modes of ammonia and nitrogen-vacancy defect centers in diamond," *J. Phys. Chem. A* **111**, 9347–9354 (2007).
98. O. P. Charkin*, N. M. Klimenko, D. O. Charkin, H.-C. Chang, and S. H. Lin, "Theoretical DFT study of fragmentation and association of heme and hemin," *J. Phys. Chem. A* **111**, 9207–9217 (2007).
97. S. Sabu, F.-C. Yang, Y.-S. Wang, W.-H. Chen, H.-C. Chang, and C.-C. Han*, "Peptide analysis: Solid phase extraction-elution on diamond (SPEED) combined with atmospheric pressure MALDI-FTICR mass spectrometry," *Anal. Biochem.* **367**, 190–200 (2007).
96. W.-P. Peng, H.-C. Lin, H.-H. Lin, M.-L. Chu, A. L. Yu, H.-C. Chang, and C.-H. Chen*, "Charge-monitoring laser-induced acoustic desorption mass spectrometry for cell and microparticle mass distribution measurement," *Angew. Chem. Int. Ed.* **46**, 3865–3869 (2007).
95. T. T. B. Nguyen, H.-C. Chang*, and V. W.-K. Wu, "Adsorption and hydrolytic activity of lysozyme on diamond nanocrystallites," *Diamond Relat. Mater.* **16**, 872–876 (2007).

94. K. K. Liang*, C.-K. Lin, H.-C. Chang, A. A. Villaeys, M. Hayashi, and S. H. Lin, "Calculation of the vibrationally non-relaxed photo-induced electron transfer rate constant in dye-sensitized solar cells," *Phys. Chem. Chem. Phys.* **9**, 853–861 (2007).
93. C.-C. Fu, H.-Y. Lee, K. Chen, T.-S. Lim, H.-Y. Wu, P.-K. Lin, P.-K. Wei, P.-H. Tsao, H.-C. Chang*, and W. Fann*, "Characterization and application of single fluorescent nanodiamonds as cellular biomarkers," *Proc. Natl. Acad. Sci. USA* **104**, 727–732 (2007).
92. W.-C. Chang, L.-C. L. Huang, Y.-S. Wang, W.-P. Peng, H.-C. Chang, N.-Y. Hsu, W.-B. Yang, and C.-H. Chen*, "Matrix-assisted laser desorption/ionization (MALDI) mechanism revisited," *Anal. Chim. Acta* **582**, 1–9 (2007).
91. Z. X. Nie, Y.-K. Tzeng, H.-C. Chang*, C.-C. Chiu, C.-Y. Chang, C.-M. Chang, and M.-H. Tao, "Microscopy-based mass measurement of a single whole virus in a cylindrical ion trap," *Angew. Chem. Int. Ed.* **45**, 8131–8134 (2006).
90. K. K. Liang*, C.-K. Lin, H.-C. Chang, M. Hayashi, and S. H. Lin, "Theoretical treatments of ultrafast electron transfer from adsorbed dye molecule to semiconductor nanocrystalline surface," *J. Chem. Phys.* **125**, 154706 (2006) (*16pp*).
89. Y.-S. Wang, S. Sabu, S.-C. Wei, C.-M. J. Kao, X. L. Kong, S.-C. Liau, C.-C. Han, H.-C. Chang*, S.-Y. Tu, A. H. Kung, and J. Z. H. Zhang, "Dissociation of heme from gaseous myoglobin ions studied by infrared multiphoton dissociation spectroscopy and Fourier-transform ion cyclotron resonance mass spectrometry," *J. Chem. Phys.* **125**, 133310 (2006) (*7pp*).
88. W.-H. Chen, S.-C. Lee, S. Sabu, H.-C. Fang, S.-C. Chung, C.-C. Han*, and H.-C. Chang*, "Solid phase extraction and elution on diamond (SPEED): A fast and general platform for proteome analysis with mass spectrometry," *Anal. Chem.* **78**, 4228–4234 (2006).
87. X. L. Kong, I.-A. Tsai, S. Sabu, C.-C. Han, Y. T. Lee, H.-C. Chang*, S.-Y. Tu, A. H. Kung, and C.-C. Wu, "Progressive stabilization of zwitterionic structures in $H^+(Ser)_{2-8}$ studied by infrared photodissociation spectroscopy," *Angew. Chem. Int. Ed.* **45**, 4130–4135 (2006).
86. H.-C. Chang*, K. Chen, and S. Kwok*, "Nanodiamond as a possible carrier of extended red emission," *Astrophys. J.* **639**, L63–L66 (2006).
85. Z. X. Nie, C.-W. Lin, W.-P. Peng, Y. T. Lee, and H.-C. Chang*, "Frequency scan of a quadrupole mass analyzer in the third stability region for protein analysis," *J. Chin. Chem. Soc.* **53**, 47–52 (2006).
84. W.-P. Peng, Y.-C. Yang, M.-W. Kang, Y.-K. Tzeng, Z. X. Nie, H.-C. Chang*, W. Chang, and C.-H. Chen, "Laser-induced acoustic desorption mass spectrometry of single bioparticles," *Angew. Chem. Int. Ed.* **45**, 1423–1426 (2006).
83. S.-J. Yu, M.-W. Kang, H.-C. Chang*, K.-M. Chen, and Y.-C. Yu, "Bright fluorescent nanodiamonds: No photobleaching and low cytotoxicity," *J. Am. Chem. Soc.* **127**, 17604–17605 (2005).
82. O. P. Charkin*, N. M. Klimenko, P. T. Nguyen, D. O. Charkin, A. M. Mebel, S. H. Lin, Y.-S. Wang, S.-C. Wei, and H.-C. Chang, "Fragmentation of heme and $hemin^+$ with sequential loss of carboxymethyl groups: A DFT and mass-spectrometry study," *Chem. Phys. Lett.* **415**, 362–369 (2005).
81. W.-P. Peng, Y.-C. Yang, C.-W. Lin, and H.-C. Chang*, "Molar mass and molar mass distribution of polystyrene particle size standards," *Anal. Chem.* **77**, 7084–7089 (2005).
80. O. P. Charkin*, N. M. Klimenko, P. T. Nguyen, D. O. Charkin, Y.-S. Wang, S.-C. Wei, H.-C. Chang, and S. H. Lin, "Theoretical study of fragmentation of heme and its ion with successive removal of carboxymethyl groups," *Russ. J. Inorg. Chem.* **50**, 1398–1407 (2005).
79. X. L. Kong, L. C. L. Huang, S.-C. V. Liau, C.-C. Han, and H.-C. Chang*, "Polylysine-coated diamond nanocrystals for MALDI-TOF mass analysis of DNA oligonucleotides," *Anal. Chem.* **77**, 4273–4277 (2005).
78. C.-K. Lin, C.-C. Wu, Y.-S. Wang, Y. T. Lee, H.-C. Chang*, J.-L. Kuo*, and M. L. Klein,

"Vibrational predissociation spectra and hydrogen-bond topologies of $H^+(H_2O)_{9\text{-}11}$," *Phys. Chem. Chem. Phys.* **7**, 938–944 (2005).

77. C.-C. Wu, C.-K. Lin, H.-C. Chang*, J. C. Jiang, J.-L. Kuo*, and M. L. Klein, "Protonated clathrate cages enclosing neutral water molecules: $H^+(H_2O)_{21}$ and $H^+(H_2O)_{28}$," *J. Chem. Phys.* **122**, 074315 (2005) (*9pp*).
76. W.-P. Peng, Y. T. Lee, J. W. Ting*, and H.-C. Chang*, "Averaging peak-to-peak voltage detector for absolute mass determination of single particles with quadrupole ion traps," *Rev. Sci. Instrum.* **76**, 023108 (2005) (*5pp*).
75. X. L. Kong, L. C. L. Huang, C.-M. Hsu, W.-H. Chen, C.-C. Han, and H.-C. Chang*, "High-affinity capture of proteins by diamond nanoparticles for mass spectrometric analysis," *Anal. Chem.* **77**, 259–265 (2005).
74. J.-W. Wang*, Y.-M. Chang, H.-C. Chang, S.-H. Lin, L.-C. L. Huang, X.-L. Kong, and M.-W. Kang, "Local structure dependence of the charge transfer band in nanocrystalline Y_2O_3: Eu^{3+}," *Chem. Phys. Lett.* **405**, 314–317 (2005).
73. C. Chaudhuri, C.-C. Wu, J. C. Jiang, and H.-C. Chang*, "Comparative studies of $H^+(C_6H_6)(H_2O)_{1,2}$ and $H^+(C_5H_5N)(H_2O)_{1,2}$ by DFT calculations and IR spectroscopy," *Aust. J. Chem.* **57**, 1153–1156 (2004).
72. W.-P. Peng, Y.-C. Yang, M.-W. Kang, Y. T. Lee, and H.-C. Chang*, "Measuring masses of single bacterial whole cells with a quadrupole ion trap," *J. Am. Chem. Soc.* **126**, 11766–11767 (2004).
71. Y.-Y. Cheng, H.-C. Chang*, G. C. Hoops, and M.-C. Su, "Stabilization of yeast cytochrome c covalently immobilized on fused silica surfaces," *J. Am. Chem. Soc.* **126**, 10828–10829 (2004).
70. L. C. L. Huang and H.-C. Chang*, "Adsorption and immobilization of cytochrome c on nanodiamonds," *Langmuir* **20**, 5879–5884 (2004).
69. C.-C. Wu, Y.-S. Wang, C. Chaudhuri, J. C. Jiang, and H.-C. Chang*, "Microsolvation of the lithium ion by methanol in the gas phase," *Chem. Phys. Lett.* **388**, 457–462 (2004).
68. C.-C. Wu, C. Chaudhuri, J. C. Jiang, Y. T. Lee, and H.-C. Chang*, "Structural isomerism and competitive proton solvation between methanol and water in $H^+(CH_3OH)_m(H_2O)_n$, $m + n = 4$," *J. Phys. Chem. A* **108**, 2859–2866 (2004).
67. A. P. Jones*, L. B. d'Hendecourt, S.-Y. Sheu, H.-C. Chang, C.-L. Cheng, and H. G. M. Hill, "Surface C-H stretching features on meteoritic nanodiamonds," *Astron. Astrophys.* **416**, 235–241 (2004).
66. Y.-Y. Cheng, S. H. Lin, H.-C. Chang*, and M.-C. Su, "Probing adsorption, orientation and conformational changes of cytochrome c on fused silica surfaces with the Soret band," *J. Phys. Chem. A* **107**, 10687–10694 (2003).
65. Y.-R. Chen, H.-C. Chang*, C.-L. Cheng, C.-C. Wang, and J. C. Jiang, "Size dependence of CH stretching features on diamond nanocrystal surfaces: Infrared spectroscopy and density functional theory calculations," *J. Chem. Phys.* **119**, 10626–10632 (2003).
64. W.-P. Peng, Y. Cai, Y. T. Lee, and H.-C. Chang*, "Laser-induced fluorescence/ion trap as a detector for mass spectrometric analysis of nanoparticles," *Int. J. Mass Spectrom.* **229**, 67–76 (2003).
63. C.-C. Wu, C. Chaudhuri, J. C. Jiang, Y. T. Lee, and H.-C. Chang*, "Hydration- induced conformational changes in protonated 2,4-pentanedione in the gas phase," *Mol. Phys.* **101**, 1285–1298 (2003).
62. K.-Y. Kim, H.-C. Chang*, Y. T. Lee, U.-I. Cho, and D. W. Boo, "Vibrational predissociation spectroscopic and ab initio theoretical studies on protonated ethylenediamine-$(water)_3$ complex," *J. Phys. Chem. A* **107**, 5007–5013 (2003).
61. Y.-S. Wang, C.-H. Tsai, Y. T. Lee, H.-C. Chang*, J. C. Jiang, O. Asvany, S. Schlemmer, and D. Gerlich, "Investigations of protonated and deprotonated water clusters using a low-temperature 22-pole ion trap," *J. Phys. Chem. A* **107**, 4217–4225 (2003).
60. Y. Cai, W.-P. Peng, and H.-C. Chang*, "Ion trap mass spectrometry of fluorescently labeled nanoparticles," *Anal. Chem.* **75**, 1805–1811 (2003).

59. S.-Y. Sheu, I.-P. Lee, Y. T. Lee, and H.-C. Chang*, "Laboratory investigations of hydrogenated diamond surfaces by infrared spectroscopy: Implications for the formation and size of interstellar nanodiamonds," *Astrophys. J.* **581**, L55–L58 (2002).
58. J. C. Jiang, C. Chaudhuri, Y. T. Lee, and H.-C. Chang*, "Hydrogen bond rearrangements and interconversions of $H^+(CH_3OH)_4H_2O$ cluster isomers," *J. Phys. Chem. A* **106**, 10937–10944 (2002).
57. C.-C. Wu, C. Chaudhuri, J. C. Jiang, Y. T. Lee, and H.-C. Chang*, "On the first overtone spectra of protonated water clusters $[H^+(H_2O)_{3-5}]$ in the free-OH stretch region," *J. Chin. Chem. Soc.* **49**, 769–775 (2002).
56. Y. Cai, W.-P. Peng, S.-J. Kuo, S. Sabu, C.-C. Han, and H.-C. Chang*, "Optical detection and charge-state analysis of MALDI-generated particles with molecular masses larger than 5 MDa," *Anal. Chem.* **74**, 4434–4440 (2002).
55. Y. Cai, W.-P. Peng, S.-J. Kuo, and H.-C. Chang*, "Calibration of an audio-frequency ion trap mass spectrometer," *Int. J. Mass Spectrom.* **214**, 63–73 (2002).
54. C.-F. Chen, C.-C. Wu, C.-L. Cheng, S.-Y. Sheu, and H.-C. Chang*, "The size of interstellar nanodiamonds revealed by infrared spectra of CH on synthetic diamond nanocrystal surfaces," *J. Chem. Phys.* **116**, 1211–1214 (2002).
53. Y. Cai, W.-P. Peng, S.-J. Kuo, Y. T. Lee, and H.-C. Chang*, "Single-particle mass spectrometry of polystyrene microspheres and diamond nanocrystals," *Anal. Chem.* **74**, 232–238 (2002).
52. C. Chaudhuri, J. C. Jiang, C.-C. Wu, X. Wang, and H.-C. Chang*, "Characterization of protonated formamide-containing clusters by infrared spectroscopy and ab initio calculations: II. Hydration of formamide in the gas phase," *J. Phys. Chem. A* **105**, 8906–8915 (2001).
51. C. Chaudhuri, Y.-S. Wang, J. C. Jiang, Y. T. Lee, H.-C. Chang*, and G. Niedner-Schatteburg, "Infrared spectra and isomeric structures of hydroxide-water cluster ions $OH^-(H_2O)_{1-5}$: A comparison with $H_3O^+(H_2O)_{1-5}$," *Mol. Phys.* **99**, 1161–1173 (2001).
50. Y. D. Glinka*, K.-W. Lin, H.-C. Chang, S. H. Lin, and Y. T. Chen, "Power laser light-induced photoluminescence from detonation-synthesized 5nm-sized diamonds," *Defect Diffusion Forum* **186-187**, 37–44 (2000).
49. C.-C. Wu, J. C. Jiang, I. Hahndorf, C. Chaudhuri, Y. T. Lee, and H.-C. Chang*, "Characterization of protonated formamide-containing clusters by infrared spectroscopy and ab initio calculations: I. O-protonation," *J. Phys. Chem. A* **104**, 9556–9565 (2000).
48. C. Chaudhuri, J. C. Jiang, X. Wang, Y. T. Lee, and H.-C. Chang*, "Identification of $CH_3OH_2^+$- and H_3O^+-centered isomers from fragment-dependent vibrational predissociation spectra of $H^+(CH_3OH)_4H_2O$," *J. Chem. Phys.* **112**, 7279–7282 (2000).
47. J. C. Jiang, H.-C. Chang, Y.-S. Wang, S. H. Lin, Y. T. Lee, G. Niedner-Schatteburg, and H.-C. Chang*, "Infrared spectra of $H^+(H_2O)_{5-8}$ clusters: Evidence for symmetric proton hydration," *J. Am. Chem. Soc.* **122**, 1398–1410 (2000).
46. H.-C. Chang*, J. C. Jiang, H.-C. Chang, L. R. Wang, and Y. T. Lee, "Hydrogen bond rearrangement and intermolecular proton transfer in protonated methanol clusters," *Israel J. Chem.* **39**, 231–243 (2000).
45. C.-C. Wu, J. C. Jiang, D. W. Boo, S. H. Lin, Y. T. Lee, and H.-C. Chang*, "Behaviors of an excess proton in solute-containing water clusters: A case study of $H^+(CH_3OH)(H_2O)_{1-6}$," *J. Chem. Phys.* **112**, 176–188 (2000).
44. I. Hahndorf, J. C. Jiang, H.-C. Chang, C.-C. Wu, and H.-C. Chang*, "Proton-assisted hydration at hydrophobic sites in protonated ether and keto dimers," *J. Phys. Chem. A* **103**, 8753–8761 (1999).
43. H.-C. Chang*, J. C. Jiang, H.-C. Chang, Y.-S. Wang, S. H. Lin, and Y. T. Lee, "On the search for $H_5O_2^+$-centered water clusters in the gas phase," *J. Chin. Chem. Soc.* **46**, 427–434 (1999).
42. R. Chang, J. C. Jiang, P.-J. Hsieh, H.-C. Chang, and S. H. Lin*, "Theory of vibrational predissociation spectroscopy," *J. Chin. Chem. Soc.* **46**, 417–426 (1999).

41. Y. D. Glinka, K.-W. Lin, H.-C. Chang, and S. H. Lin*, "Multiphoton-excited luminescence from diamond nanoparticles," *J. Phys. Chem. B* **103**, 4251–4263 (1999).
40. H.-C. Chang, J. C. Jiang, I. Hahndorf, S. H. Lin, Y. T. Lee, and H.-C. Chang*, "Migration of an excess proton upon asymmetric hydration: $H^+[(CH_3)_2O](H_2O)_n$ as a model system," *J. Am. Chem. Soc.* **121**, 4443–4450 (1999).
39. J. C. Jiang, H.-C. Chang, Y. T. Lee, and S. H. Lin*, "Ab initio studies of $NH_4^+(H_2O)_{1-5}$ and the influence of hydrogen-bonding nonadditivity on geometries and vibrations," *J. Phys. Chem. A* **103**, 3123–3135 (1999).
38. H.-C. Chang, J. C. Jiang, S. H. Lin, Y. T. Lee, and H.-C. Chang*, "Isomeric transitions between linear and cyclic $H^+(CH_3OH)_{4,5}$: Implications for proton migration in liquid methanol," *J. Phys. Chem. A* **103**, 2941–2944 (1999).
37. H.-C. Chang, Y.-S. Wang, Y. T. Lee, and H.-C. Chang*, "Studying protonated ion hydration by infrared spectroscopy of size-selected $NH_4^+(H_2O)_n$ clusters in a free jet expansion," *Int. J. Mass Spectrom.* **179/180**, 91–102 (1998).
36. C.-C. Chuang, S. N. Tsang, W. Klemperer*, and H.-C. Chang, "Vibrational predissociation dynamics of ArHF (3000) and (3110): Lifetimes and HF product state distributions," *J. Chem. Phys.* **109**, 8836–8841 (1998).
35. Y.-S. Wang, H.-C. Chang, J. C. Jiang, S. H. Lin, Y. T. Lee, and H.-C. Chang*, "Structures and isomeric transitions of $NH_4^+(H_2O)_{3-6}$: From single to double rings," *J. Am. Chem. Soc.* **120**, 8777–8788 (1998).
34. K.-W. Lin, C.-L. Cheng, and H.-C. Chang*, "Laser-induced intracluster reactions of oxygen-containing nanodiamonds," *Chem. Mater.* **10**, 1735–1737 (1998).
33. C.-C. Chuang, S. N. Tsang, W. Klemperer*, and H.-C. Chang, "Vibrational predissociation of an inert gas cluster containing an active molecule: The $v_{HF} = 3$ spectrum of Ar_3HF," *J. Chem. Phys.* **109**, 484–491 (1998).
32. J. C. Jiang, J.-C. Chang, B.-C. Wang, S. H. Lin, Y. T. Lee, and H.-C. Chang*, "The free-OH stretching frequencies of 3-coordinated H_2O in water clusters and on ice surfaces," *Chem. Phys. Lett.* **289**, 373–382 (1998).
31. Y.-S. Wang, J. C. Jiang, C.-L. Cheng, S. H. Lin, Y. T. Lee, and H.-C. Chang*, "Identifying 2- and 3-coordinated H_2O in protonated ion-water clusters by vibrational predissociation spectroscopy and ab initio calculations," *J. Chem. Phys.* **107**, 9695–9698 (1997).
30. C.-C. Chuang, S. N. Tsang, J. G. Hanson, W. Klemperer*, and H.-C. Chang, "Laser-induced fluorescence spectroscopy of Ar_2HF at $v_{HF} = 3$: An examination of three-body forces," *J. Chem. Phys.* **107**, 7041–7056 (1997).
29. C.-C. Chuang, S. N. Tsang, W. Klemperer*, and H.-C. Chang, "Reassignment of the 11537 cm^{-1} band of hydrogen fluoride dimer and observation of the intermolecular combination mode $3\nu_1+\nu_4$," *J. Phys. Chem.* **101**, 6702–6708 (1997).
28. C.-L. Cheng, H.-C. Chang*, J.-C. Lin*, K.-J. Song, and J.-K. Wang, "Direct observation of hydrogen etching anisotropy on diamond single crystal surfaces," *Phys. Rev. Lett.* **78**, 3713–3716 (1997).
27. C.-L. Cheng, J.-C. Lin*, and H.-C. Chang*, "The absolute absorption strength and vibrational coupling of CH stretching on diamond C(111)," *J. Chem. Phys.* **106**, 7411–7421 (1997).
26. W.-K. Liu, M. Hayashi, J.-C. Lin, H.-C. Chang, S. H. Lin*, and J.-K. Wang, "Effect of temperature on the infrared and sum-frequency generation spectra of adsorbates," *J. Chem. Phys.* **106**, 5920–5927 (1997).
25. C.-L. Cheng, J.-C. Lin*, H.-C. Chang*, and J.-K Wang, "Characterization of CH stretches on diamond C(111) single- and nanocrystals by infrared absorption spectroscopy," *J. Chem. Phys.* **105**, 8977–8978 (1996).
24. S. N. Tsang, C.-C. Chuang, R. Mollaaghababa, W. Klemperer*, and H.-C. Chang, "Intermolecular state dependence of the vibrational predissociation of N_2-HF," *J. Chem. Phys.* **105**, 4385–4387 (1996).

23. J.-C. Lin*, K.-H. Chen, H.-C. Chang*, C.-S. Tsai, C.-E. Lin, and J.-K. Wang*, "The vibrational dephasing and relaxation of CH and CD stretches on diamond surfaces: An anomaly," *J. Chem. Phys.* **105**, 3975–3983 (1996).
22. H.-C. Chang* and W. Klemperer*, "A phenomenological model for the vibrational dependence of hydrogen interchange tunneling in HF dimer," *J. Chem. Phys.* **104**, 7830–7835 (1996).
21. H.-C. Chang* and J.-C. Lin*, "Structure and bonding of C_2H_2 on diamond C(111)-1x1:H: Infrared spectroscopy and exciton calculations," *J. Phys. Chem.* **100**, 7018–7025 (1996).
20. H.-C. Chang* and J.-C. Lin, "Infrared spectroscopy of adsorbed CO_2 as a probe for the surface heterogeneity of diamond C(111)-1x1:H," *Appl. Phys. Lett.* **67**, 2474–2476 (1995).
19. H.-C. Chang*, J.-C. Lin, J.-Y. Wu, and K.-H. Chen, "Infrared spectroscopy and vibrational relaxation of CH_x and CD_x stretches on synthetic diamond nanocrystal surfaces," *J. Phys. Chem.* **99**, 11081–11088 (1995).
18. H.-C. Chang*, D. J. Dai, and G. E. Ewing, "Vibrational spectroscopy as a probe of surface heterogeneity: CO on NaCl(100)," *J. Chin. Chem. Soc.* **42**, 317–324 (1995).
17. H.-C. Chang, F.-M. Tao, S. N. Tsang, and W. Klemperer*, "Dependence of the intermolecular potentials of ArHF and N_2HF on HF bond length," *J. Chin. Chem. Soc.* **42**, 141–148 (1995).
16. R. Mollaaghababa, H.-C. Chang, and W. Klemperer*, "Vibrational predissociation of HFHCl by overtone excitation of HF," *Can. J. Phys.* **72**, 693–696 (1994).
15. S. N. Tsang, H.-C. Chang, and W. Klemperer*, "Characterization of N_2HF at $3\nu_1$ HF stretch," *J. Phys. Chem.* **98**, 7313–7318 (1994).
14. H.-C. Chang and W. Klemperer*, "High overtone spectroscopy and photodissociation of hydrogen fluoride complexes," *Faraday Discuss.* **97**, 95–103 (1994).
13. H.-C. Chang and W. Klemperer*, "The vibrational second overtones of HF dimer: A quartet," *J. Chem. Phys.* **100**, 1–14 (1994).
12. H.-C. Chang, F.-M. Tao, W. Klemperer*, C. Healey, and J. M. Hutson, "The Ar-HF intermolecular potential: Overtone spectroscopy and ab initio calculations," *J. Chem. Phys.* **99**, 9337–9349 (1993).
11. H.-C. Chang and W. Klemperer*, "State-specific vibrational predissociation and interconversion tunneling quenching at $3\nu_1$ and $3\nu_2$ of $(HF)_2$," *J. Chem. Phys.* **98**, 9266–9278 (1993).
10. H.-C. Chang and W. Klemperer*, "Observation of ArHF(3000) and its combination modes by laser-induced fluorescence," *J. Chem. Phys.* **98**, 2497–2506 (1993).
9. H.-C. Chang and G. E. Ewing*, "Vibrational relaxation of molecules on alkali halide surfaces," Proceedings Vibrations at Surfaces, New York, 1990; also in *J. Electron Spectrosc. Relat. Phenom.* **54**, 39–63 (1990).
8. R. S. Disselkamp, H.-C. Chang, and G. E. Ewing*, "Infrared spectroscopy of CO on NaCl(100): IV. Bandshape analysis," *Surf. Sci.* **240**, 193–210 (1990).
7. H.-C. Chang and G. E. Ewing*, "Infrared fluorescence from a monolayer of CO on NaCl(100)," *Phys. Rev. Lett.* **65**, 2125–2128 (1990).
6. H.-C. Chang and G. E. Ewing*, "Vibrational energy transfer and population inversion in CO overlayers on NaCl(100)," *J. Phys. Chem.* **94**, 7635–7641 (1990).
5. H.-C. Chang, C. Noda, and G. E. Ewing*, "CO on NaCl(100): Model system for investigating vibrational energy flow," *J. Vac. Sci. Technol.* **A8**, 2644–2648 (1990).
4. H.-C. Chang and G. E. Ewing*, "The quantum efficiency of vibrationally induced desorption for a monolayer of CO on NaCl(100)," *Chem. Phys.* **139**, 55–65 (1989).
3. H. H. Richardson, H.-C. Chang, C. Noda, and G. E. Ewing*, "Infrared spectroscopy of CO on NaCl(100): I. Photometry," *Surf. Sci.* **216**, 93–104 (1989).
2. H.-C. Chang, H. H. Richardson, and G. E. Ewing*, "Epitaxial growth of CO on NaCl(100) studied by infrared spectroscopy," *J. Chem. Phys.* **89**, 7561–7568 (1988).
1. H.-C. Chang and K.-H. Houng*, "DMSO intercalation as a method in the identification of

kaolinite from chlorite in soil clay samples," *Bull. Inst. Chem. Acad. Sinica* **31**, 31–39 (1984).

- ***Review Articles***

20. Y. Y. Hui*, T.-N. Le, T.-I. Yang, J. Chen*, and H.-C. Chang, "Emerging trends in fluorescent nanodiamond quantum sensing," *Nano Futures* **8**, 042001 (2024) (*16pp*).
19. W. W.-W. Hsiao*, X. M. Lam, T.-N. Le, C.-A. Cheng*, and H.-C. Chang, "Exploring nanodiamonds: Leveraging their dual capacities for anticancer photothermal therapy and temperature sensing," *Nanoscale* **16**, 14994–15008 (2024).
18. S. Angela, G, Fadhilah, H.-Y. Lin, J. Ko, S. C.-W. Lu, C.-C. Lee, Y.-S. Chang, C.-Y. Lin, H.-C. Chang, W. W.-W. Hsiao*, and W.-H. Chiang, "Nanomaterials in the treatment and diagnosis of rheumatoid arthritis: Advanced approaches," *SLAS Technol*. **29**, 100146 (2024) (*13pp*).
17. W. W.-W. Hsiao*, G. Fadhilah, C.-C. Lee, R. Endo, Y.-J. Lin, S. Angela, C.-C. Ku, H.-C. Chang, and W.-H. Chiang*, "Nanomaterial-based biosensors for avian influenza virus: A new way forward," *Talanta* **265**, 124892 (2023) (*14pp*).
16. W. W.-W. Hsiao*, T.-N. Le, D. M. Pham, H.-H. Ko, H.-C. Chang, C.-K. Lee*, and W.-H. Chiang*, "Recent advances in novel lateral flow technologies for detection of COVID-19," *Biosensors* **11**, 295 (2021) (*26pp*).
15. W.-Z. Zhuang, Y.-H. Lin, L.-J. Su, M.-S. Wu, H.-Y. Jeng, H.-C. Chang, Y.-H. Huang*, and T.-Y. Ling*, "Mesenchymal stem/stromal cell-based therapy: mechanism, systemic safety and biodistribution for precision clinical applications," *J. Biomed. Sci.* **28**, 1–38 (2021).
14. Y.-Y. Liu, B.-M. Chang, and H.-C. Chang*, "Nanodiamond-enabled biomedical imaging," *Nanomedicine* **15**, 1599–1616 (2020) (*29pp*).
13. C. Bradac*, S. F. Lim, H.-C. Chang, and I. Aharonovich, "Optical nanoscale thermometry: from fundamental mechanisms to emerging practical applications," *Adv. Opt. Mater.* **8**, 2000183 (2020).
12. S. Sotoma, F.-J. Hsieh, and H.-C. Chang*, "Biohybrid fluorescent nanodiamonds as dual-contrast markers for light and electron microscopies," *J. Chin. Chem. Soc.* **65**, 1136–1146 (2018).
11. S. Sotoma, C. P. Epperla, and H.-C. Chang*, "Diamond nanothermometry," *ChemNanoMat* **4**, 15–27 (2018).
10. Y. Y. Hui, W. W.-W. Hsiao, S. Haziza, M. Simonneau, F. Treussart*, and H.-C. Chang*, "Single particle tracking of fluorescent nanodiamonds in cells and organisms," *Curr. Opin. Solid State Mater. Sci.* **21**, 35–42 (2017).
9. W. W.-W. Hsiao, Y. Y. Hui, P.-C. Tsai, and H.-C. Chang*, "Fluorescent nanodiamond: A versatile tool for long-term cell tracking, super-resolution imaging, and nanoscale temperature sensing," *Acc. Chem. Res.* **49**, 400–407 (2016).
8. V. Vaijayanthimala, D. K. Lee, S. V. Kim, A. Yen, N. Tsai, D. Ho*, H.-C. Chang*, and O. Shenderova*, "Nanodiamond-mediated drug delivery and imaging: challenges and opportunities," *Expert Opin. Drug Deliv.* **12**, 735–749 (2015).
7. Y. Y. Hui* and H.-C. Chang*, "Recent developments and applications of nanodiamonds as versatile bioimaging agents," *J. Chin. Chem. Soc.* **61**, 67–76 (2014).
6. Y. Y. Hui*, C.-L. Cheng*, and H.-C. Chang*, "Nanodiamonds for optical bioimaging," *J. Phys. D: Appl. Phys.* **43**, 374021 (2010) (*11pp*).
5. C.-C. Wu, C.-C. Han, and H.-C. Chang*, "Applications of surface-functionalized diamond nanoparticles for mass-spectrometry-based proteomics," *J. Chin. Chem. Soc.* **57**, 583–594 (2010).
4. H.-C. Chang*, "Ultrahigh-mass mass spectrometry of single biomolecules and bioparticles," *Annu. Rev. Anal. Chem.* **2**, 169–185 (2009).
3. V. Vaijayanthimala and H.-C. Chang*, "Functionalized fluorescent nanodiamonds for biomedical applications," *Nanomedicine* **4**, 47–55 (2009).
2. H.-C. Chang*, C.-C. Wu, and J.-L. Kuo*, "Recent advances in understanding the

structures of medium-sized protonated water clusters," *Int. Rev. Phys. Chem.* **24**, 553–578 (2005).

1. W.-P. Peng, Y. Cai, and H.-C. Chang*, "Optical detection methods for mass spectrometry of macroions," *Mass Spectrom. Rev.* **23**, 443–465 (2004).

- ***Book Chapters***

13. W. W.-W. Hsiao, T.-N. Le, and H.-C. Chang, "Applications of fluorescent nanodiamond in biology," in *Encyclopedia of Analytical Chemistry*, ed. J.-R. Albani (Wiley, 2022), Chap. a9776.
12. C. P. Epperla, H.-H. Lin, and H.-C. Chang, "Nanodiamonds and their biological applications," in *Carbon Nanostructures for Biomedical Applications*, eds. T. Da Ros, N. Martin, and J.-F. Nierengarten (RSC, 2021), 257–292.
11. Y. Y. Hui, O. Y. Chen, H.-C. Chang, and M.-C. Su, "Diamond nanothermometry," in *21st Century Nanoscience – A Handbook: Exotic Nanostructures and Quantum Systems* (Volume Five), ed. K. D. Sattler (CRC Press, 2020), Chap. 26, 26-1–26-18.
10. W. W.-W. Hsiao, H.-H. Lin, and H.-C. Chang, "Diamond nanoparticles for drug delivery and monitoring," in *Carbon-Based Nanosensor Technology*, Springer Series on Chemical Sensors and Biosensors, ed. C. Kranz (Springer, 2019), 17: 119–140.
9. B.-M. Chang, D. Ho, and H.-C. Chang, "Biomarkers and drug delivery applications," in *Nanodiamonds: Advanced Material Analysis, Properties and Applications*, ed. J.-C. Arnault (Elsevier, 2017), Chap. 16, pp. 403–417.
8. Y. Y. Hui*, C.-A. Cheng, O. Y. Chen, and H.-C. Chang, "Bioimaging and quantum sensing using NV centers in diamond nanoparticles," in *Carbon Nanoparticles and Nanostructures*, Carbon Nanostructures, eds. N. Yang, X. Jiang, and D.-W. Pang (Springer, 2016), pp. 109–137.
7. W. W.-W. Hsiao, H.-H. Lin, F.-J. Hsieh, and H.-C. Chang, "Surface-modified nanodiamonds," in *Carbon Nanomaterials Sourcebook: Graphene, Fullerenes, Nanotubes, and Nanodiamonds*, Vol. I, ed. K. D. Sattler (CRC Press, 2016), Chap. 22, pp. 517–533.
6. V. Vaijayanthimala, C. P. Epperla, and H.-C. Chang, "Nanodiamonds," in *Nanoparticles for Biotherapeutic Delivery*, Vol. 2, eds. J. D. Ramsey and M. L. Forrest (Future Science, 2015), Chap. 11, pp. 30–42.
5. N. Mohan and H.-C. Chang, "Fluorescent nanodiamonds and their prospects in bioimaging," in *Optical Engineering of Diamond*, eds. R. Mildren and J. Rabeau (Wiley, 2013), Chap. 13, pp. 445–471.
4. V. Vaijayanthimala, Y. Y. Hui, and H.-C. Chang, "Nanodiamonds for bioimaging and therapeutic applications," in *The Nanobiotechnology Handbook*, ed. Y. Xie (CRC Press, 2012), Chap. 25, pp. 537–563.
3. W. K. Liu, A. Adnan, A. Kopacz, M. Hallikainen, D. Ho, R. Lam, J. Lee, T. Belytschko, G. Schatz, Y. Tzeng, Y.-J. Kim, S. Baik, M. K. Kim, T. Kim, J. Lee, E.-S. Hwang, S. Im, E. Osawa, A. Barnard, H.-C. Chang, and C.-C. Chang, "Design of nanodiamond based drug delivery patch for cancer therapeutics and imaging applications," in *Nanodiamonds: Applications in Biology and Nanoscale Medicine*, ed. D. Ho (Springer, 2009), Chap. 12, pp. 249–284.
2. H.-C. Chang, "Development and use of fluorescent nanodiamonds as cellular markers," in *Nanodiamonds: Applications in Biology and Nanoscale Medicine*, ed. D. Ho (Springer, 2009), Chap. 6, pp. 127–150.
1. C. Su, H.-C. Chang, J.-K. Wang, and J.-C. Lin, "Hydrogen chemistry on diamond surfaces: Adsorption, desorption, and vibrational spectroscopy," in *Handbook of Surfaces and Interfaces of Materials*, Vol. 2, ed. H. S. Nalwa (Academic Press, 2001), Chap. 8, pp. 315–355.

- ***Conference Proceedings***

10. Y.-H. Tsai, W.-G. Wang, C.-C. A. Chen, P.-J. Wu, H.-C. Chang, T.-P. Huang, Y.-Y. Lee, Y.-

C. Lin, Y.-T. Kang, Y.-H. Yang, and T.-I. Yang*, "Investigation of a novel EUV/SXR image sensor based on a CVD fluorescent diamond-fiber optic plate (FD-FOP) scintillator," *Proc. SPIE* **13686**, International Conference on Extreme Ultraviolet Lithography 2025, 136861S (2025).

9. W.-G. Wang, Y.-H. Tsai, C.-C. A. Chen, P.-J. Wu, H.-C. Chang, T.-P. Huang, Y.-Y. Lee, Y.-C. Lin, Y.-T. Kang, Y.-H. Yang, and T.-I. Yang*, "Development of a reflective scintillator with fluorescent nanodiamond-embedded porous anodic alumina substrate for EUV detection," *Proc. SPIE* **13686**, International Conference on Extreme Ultraviolet Lithography 2025, 136861R (2025).
8. Y.-H. Yang, Y.-T. Kang, T.-P. Huang, Y.-Y. Lee, P.-J. Wu, G.-H. Lu, C.-J. Weng, C.-H. Hwang, W.-T. Hsiao, C.-C. Kei, W.-H. Cho, C.-Y. Chang, H.-C. Chang, and T.-I. Yang*, "Eco-friendly, High-Resolution Fluorescence Diamond-Based Broadband EUV and X-Ray Beam Profiler System," 2025 IEEE International Instrumentation and Measurement Technology Conference (I2MTC). DOI: 10.1109/I2MTC62753.2025.11079069.
7. S. Sotoma*, F.-J. Hsieh, Y.-W. Chen, J. Chen, K. Wardhani, P.-C. Tsai, and H.-C. Chang*, "Characterization and applications of fluorescent nanodiamonds surface-coated with photo-crosslinked lipids," *Proc. SPIE* **10547**, 1054704 (2018) (*8pp*).
6. H.-C. Chang*, "Diamonds in space: A brief history and recent laboratory studies," *J. Phys. Conf. Ser.* **728**, 062004 (2016) (*6pp*).
5. T. Zhang, H. Cui, C.-Y. Fang, J. Jo, X. Yang, H.-C. Chang, and M. L. Forrest*, "*In vivo* photoacoustic imaging of breast cancer tumor with HER2-targeted nanodiamonds," *Proc. SPIE* **8815**, 881504 (2013) (*9pp*).
4. Y. Kuo, T.-Y. Hsu, Y.-C. Wu, J.-H. Hsu*, and H.-C. Chang*, "Fluorescence lifetime imaging microscopy of nanodiamonds *in vivo*," *Proc. SPIE* **8635**, 863503 (2013) (*7pp*).
3. X. L. Le, A.-M. Lepagnol-Bestel, M.-P. Adam, A. Thomas, G. Dantelle, C.-C. Chang, N. Mohan, H.-C. Chang, F. Treussart*, and M. Simonneau, "Fluorescent diamond nanoparticle as a probe of intracellular traffic in primary neurons in culture," *Proc. SPIE* **8232**, 823203 (2012) (*6pp*).
2. C.-C. Chang, B. Zhang, C.-Y. Li, C.-C. Hsieh, G. Duclos, F. Treussart, and H.-C. Chang*, "Exploring cytoplasmic dynamics in zebrafish yolk cells by single particle tracking of fluorescent nanodiamonds," *Proc. SPIE* **8272**, 827205 (2012) (*8pp*).
1. N. Mohan, B. Zhang, C.-C. Chang, L. Yang, C.-S. Chen, C.-Y. Fang, H.-H. Hsieh, C.-Y. Cho, Y.-C. Wu, J.-H. Weng, B.-c. Chung, and H.-C. Chang*, "Fluorescent nanodiamond – A novel nanomaterial for *in vivo* applications," *MRS Proc.* **1362**, 25–35 (2011).

PATENTS

25. H.-C. Chang, Y. Y. Hui, T.-I. Yang, and C.-Y. Ho (2026), "Extreme ultraviolet or soft X-ray radiation beam profiler," Korea patent application (10-2024-0125618).
24. H.-C. Chang, Y. Y. Hui, T.-I. Yang, and C.-Y. Ho (2026), "Extreme ultraviolet or soft X-ray radiation beam profiler," Japan patent application (2024-158776).
23. H.-C. Chang, Y. Y. Hui, T.-I. Yang, and C.-Y. Ho (2026), "Extreme ultraviolet or soft X-ray radiation beam profiler," US patent application (US-20260079272-A1).
22. H.-C. Chang, Y. Y. Hui, T.-I. Yang, and C.-Y. Ho (2026), "極紫外線或軟X射線輻射束輪廓儀 (Extreme ultraviolet or soft X-ray radiation beam profiler)," ROC Patent I910823.
21. H.-C. Chang, Y. Y. Hui, and Y.-X. Tang (2025), "Detection system and a portable detection device," US Patent 12,517,049.
20. H.-C. Chang, Y. Y. Hui, H.-H. Lin, and O. Y. Chen (2025), "Detection method and system for detecting biological samples," US Patent 12,306,189.
19. H.-C. Chang, Y. Y. Hui, and Y.-X. Tang (2024), "檢測系統 (A detection system)," ROC Patent I832469.
18. H.-M. Huang, S.-C. Hsieh, Y.-C. Chang, J.-C. Yang, and H.-C. Chang (2024), "根管治療沖洗液," ROC Patent I830453.

17. H.-C. Chang, J. J. Yu, and J.-H. Kuo (2022), "測溫式定量檢測裝置 (Thermometric quantitative detection device)," ROC Patent M635550.
16. H.-C. Chang, Y. Y. Hui, H.-H. Lin, and O. Y. Chen (2022), "用於檢測生物樣本的檢測方法及檢測系統 (Detection method and system for detecting biological samples)," ROC Patent I771198.
15. H.-C. Chang, F.-J. Hsieh, and Y.-W. Chen (2022), "Encapsulated functionalized diamond crystal," US Patent 11,366,119.
14. H.-C. Chang, F.-J. Hsieh, and Y.-W. Chen (2021), "包覆式功能化鑽石晶體 (Encapsulated functionalized diamond crystal)," ROC Patent I745593.
13. B.-M. Cheng, H.-C. Lu, J.-I. Lo, and H.-C. Chang (2021), "Fluorescent nitrogen-vacancy diamond sensing sheet, manufacturing method and uses thereof, sensor, and lithography apparatus," US Patent 11,029,421.
12. B.-M. Cheng, H.-C. Lu, J.-I. Lo, and H.-C. Chang (2021), "螢光氮空缺鑽石感測片、其製造方法與使用方法、感應器、及微影設備 (Fluorescent nitrogen-vacancy diamond (FNVD) sensing sheet, manufacturing method and uses thereof, sensor, and lithography apparatus)," ROC Patent I733183.
11. C.-H. Chen, W.-P. Peng, M.-L. Chu, H.-C. Chang, and H.-C. Lin (2015), "Bioparticle ionization with pressure controlled discharge for mass spectrometry," US Patent 8,963,075.
10. H.-C. Chang, W. Fann, and C.-C. Han (2012), "Luminescent diamond particles," US Patent 8,168,413.
9. H.-C. Chang and C.-H. Chen (2010), "Acoustic desorption mass spectrometry," US Patent 7,645,987.
8. H.-C. Chang and C.-H. Chen (2008), "聲波脫附質譜儀 (Acoustic desorption mass spectrometry)," ROC Patent I292,822.
7. C.-C. Han, H.-C. Chang, S.-C. Lee, and W.-H. Chen (2007), "Clinical applications of crystalline diamond particles," US Patent 7,326,837.
6. H.-C. Chang and C.-C. Han (2007), "鑽石微晶粒在生物科技上之應用 (Diamond crystallites for biotechnological applications)," ROC Patent I262,310.
5. H.-C. Chang and J. W. Ting (2007), "Biological whole cell mass spectrometer," US Patent 7,161,147.
4. H.-C. Chang, W.-P. Peng, and Y. Cai (2006), "探測奈米粒子之方法及其裝置 (Device of detecting nanoparticle and method of the same)," ROC Patent I257,705.
3. H.-C. Chang, W.-P. Peng, and Y. Cai (2006), "Nanoparticle ion detection," US Patent 7,119,331.
2. H.-C. Chang, W.-P. Peng, Y. Cai, and S.-J. Kuo (2006), "音頻離子阱單粒子質譜儀 (Audio-frequency single-particle ion trap mass spectrometer)," ROC Patent I250,278.
1. H.-C. Chang, W.-P. Peng, Y. Cai, and S.-J. Kuo (2004), "Ion trap mass spectrometer," US Patent 6,777,673.

INVITED INTERNATIONAL LECTURES

- "Harnessing quantum defects in fluorescent nanodiamonds for semiconductor applications," in EMRS 2026 Spring Strasbourg, France (May 25-29, 2026).
- "Quantum sensing in healthcare: Spin-enhanced immunoassays with fluorescent nanodiamonds," in BSJ 2025 Symposium, Nara, Japan (September 25, 2025).
- "Harnessing quantum defects in fluorescent nanodiamonds for semiconductor applications," in Quantum Innovation 2025, Osaka, Japan (July 29-31, 2025).
- "Fluorescent nanodiamonds with nitrogen-vacancy centers as immunodiagnostic reporters and extreme ultraviolet sensors," in 2024 New Diamond and Nano Carbon Conference (NDNC 2024), Sydney, Australia (May 27-30, 2024).

- "Nanodiamonds with fluorescent quantum defects for bioimaging and biosensing applications," in 1st International Symposium on Carbon Materials (2023 ISCM-1) for Energy, Environment, Sustainability, and Bio-applications, Tainan, Taiwan (January 31 - February 3, 2023).
- "Nitrogen-vacancy centers in nanodiamonds as temperature sensors and immunoassay reporters," in Quantum Innovation 2021, the International Symposium on Quantum Science, Technology and Innovation, Tokyo, Japan (December 7-9, 2021).
- "Fluorescent nanodiamonds: Past, present, and future," in Université Paris-Saclay, Cachan, France (November 25, 2019).
- "Diamond nanothermometry with nitrogen-vacancy centers," in 21th Takayanagi Memorial Symposium, Hamamatsu, Japan (November 12, 2019).
- "Nanodiamond-enabled biotechnology," in 14th Asian Congress on Biotechnology (ACB2019), Taipei, Taiwan (July 1-4, 2019).
- "Fluorescent nanodiamond: A versatile nanomaterial for bioimaging and quantum sensing," in 2019 New Diamond and Nano Carbon Conference (NDNC 2019), Hua-Lien, Taiwan (May 12-17, 2019).
- "Nanodiamonds for nanomedicine," in 2018 Taiwan-Japan-Korea Trilateral Conference on Nanomedicine, Tainan, Taiwan (December 13-14, 2018).
- "Promise and potential of fluorescent nanodiamonds for biomedical applications," in Institute for Protein Research, Osaka University, Japan (November 29, 2018).
- "Bioimaging and biosensing with fluorescent nanodiamonds in cells," in The 41st Annual Meeting of the Molecular Biology Society of Japan (MBSJ2018), Yokohama, Japan (November 28-30, 2018).
- "Fluorescent nanodiamonds: Fabrication, properties, and applications," in 2017 International Conference of Functional Carbons (ICFC 2017), Taipei, Taiwan (November 1-4, 2017).
- "Nanoscale temperature sensing in cells with nitrogen-vacancy centers in fluorescent nanodiamonds," in QST International Symposium, Chiba, Japan (July 25-26, 2017).
- "Materials science and technology for quantum sensing," in Quantum Sensing Gordon Research Conference, Hong Kong, PR China (July 2-7, 2017).
- "Luminescence nanothermometry with nitrogen-vacancy centers in nanodiamonds," in 9th Asian Photochemistry Conference (APC 2016), Singapore (December 4-8, 2016).
- "Long-term cell tracking and nanoscale temperature sensing with fluorescent nanodiamonds," in JSAP-OSA Joint Symposia, Niigata City, Japan (September 13-16, 2016).
- "Fluorescent nanodiamonds for long-term cell tracking and nanoscale temperature sensing," in 2016 Spring MRS Meeting, Phoenix, AZ, USA (March 28 - April 1, 2016).
- "Optical bioimaging with fluorescent nanodiamonds," in Focus on Microscopy 2016, Taipei, Taiwan (March 20-23, 2016).
- "Diamonds in space," in 11th Pacific Rim Conference on Stellar Astrophysics – Physics and Chemistry of the Late Stages of Stellar Evolution, Hong Kong, PR China (December 14-17, 2015).
- "Time-resolved luminescence nanothermometry with nitrogen-vacancy centers in nanodiamonds," in AVS 62nd International Symposium and Exhibition, San Jose, CA, USA (October 18-23, 2015).
- "Engineering fluorescent nanodiamonds for nanomedicine applications," in Second Israel-Taiwan Conference – from Basic to Translation Research in Life Sciences, Tel-Aviv, Israel (June 6-7, 2015).
- "Bioimaging and quantum sensing using nitrogen-vacancy centers in nanodiamonds," in SPIE Photonics West, San Francisco, CA, USA (February 7-12, 2015).

- "Bioimaging and quantum sensing with fluorescent nanodiamonds," in 2015 International Symposium toward the Future of Advanced Researches in Shizuoka University, Hamamatsu, Shizuoka, Japan (January 27-28, 2015).
- "Bioimaging and quantum sensing using nitrogen-vacancy centers in nanodiamonds," in Frontiers in Optics 2014/Laser Science XXX (FiO/LS), Tucson, Arizona, USA (October 19-23, 2014).
- "Bioimaging and quantum sensing using nitrogen-vacancy centers in nanodiamonds," in Spring 2014 E-MRS, Lille, France (May 26-30, 2014).
- "Ion-irradiated nanodiamonds as versatile contrast agents for bioimaging," in MRS 2014 Spring Meeting and Exhibit, San Francisco, CA, USA (April 21-25, 2014).
- "Stem cell tracking using fluorescent nanodiamonds," in 7th Pan Pacific Symposium on Stem Cells and Cancer Research (PPSSC), Taichung, Taiwan (April 12-14, 2014).
- "Bioconjugated nanodiamonds for optical imaging and therapeutic applications," in MRS-ASAP Nanodiamond Symposium, Kyoto, Japan (September 16-20, 2013).
- "Highly fluorescent nanodiamonds protein-functionalized for fluorescence lifetime imaging *in vitro* and *in vivo*," in Workshop on Diamond: Spintronics, Photonics, Bio-applications, Hong Kong SAR, China (April 27-29, 2013).
- "High-brightness fluorescent nanodiamonds for *in vivo* applications," in SPIE Photonics West, San Francisco, CA, USA (February 2-7, 2013).
- "Fabrication and characterization of fluorescent nanodiamonds for bioimaging applications," in Department of Physics, The Chinese University of Hong Kong (CUHK), Hong Kong SAR, China (April 27, 2012).
- "Fluorescent nanodiamonds for *in vitro* and *in vivo* applications," in MRS 2012 Spring Meeting and Exhibit, San Francisco, CA, USA (April 9-13, 2012).
- "*In vitro* and *in vivo* applications of fluorescent nanodiamonds," in SPIE Photonics West, San Francisco, CA, USA (January 21-26, 2012).
- "Development and use of functionalized fluorescent nanodiamonds," in MRS 2011 Spring Meeting and Exhibit, San Francisco, CA, USA (April 25-29, 2011).
- "Nanodiamonds for optical bioimaging," in 476th Wilhelm and Else Heraeus-Seminar on Diamond: Spintronics, Photonics, Bio-applications, Bonn, Germany (April 4-7, 2011).
- "Fluorescent nanodiamonds for super-resolution bioimaging and long-term cell tracking," in 76th Israel Chemical Society Annual Meeting, Tel-Aviv, Israel (February 9-10, 2011)
- "Functionalized fluorescent nanodiamond as a novel material for bioimaging applications," in E-MRS 2010 Spring Meeting, Strasbourg, France (June 7-11, 2010).
- "Functionalized fluorescent nanodiamonds for biological applications," in 239th ACS National Meeting and Exhibition, San Francisco, CA, USA (March 21-25, 2010).
- "Spectroscopy of fluorescent nanodiamonds as photostable biolabels and fluorescence resonance energy transfer donors," in 2nd Asian Spectroscopy Conference, Seoul, South Korea (November 30 - December 2, 2009).
- "Functionalized fluorescent nanodiamonds for biological applications," in 2nd International Conference on New Diamond and Nano Carbon (NDNC-2008), Taipei, Taiwan (May 26-29, 2008).
- "Measuring masses of single viruses and biological cells with a quadrupole ion trap," in Center of Excellence in Analytical Chemistry (CEAC), ETH, Zurich, Switzerland (January 18, 2007).
- "Biotechnological applications of nanodiamonds," in 17th European Conference on Diamond, Diamond-Like Materials, Carbon Nanotubes and Nitrides, Estoril, Portugal (September 3-8, 2006).
- "Studying biomolecular complexes with infrared photodissociation spectroscopy and ion cyclotron resonance mass spectrometry," in International Conference on Physics Education and Frontier Physics, the 5th Joint Meeting of the Chinese Physicists Worldwide (OCPA5),

Taipei, Taiwan (June 27-30, 2006).

- "Studying noncovalent biomolecular complexes with infrared photodissociation spectroscopy in an ion cyclotron resonance cell," in Sendai International Symposium on Molecular Cluster Spectroscopy, Sendai, Japan (May 29-30, 2006).
- "Laser-induced acoustic desorption mass spectrometry of single viruses and biological cells," in 7th Asia-Pacific Conference on Human Genetics (HUGO-AP2006), Taipei, Taiwan (March 6-10, 2006).
- "Microsolvation of protons in gas-phase water and biomolecular clusters," in Pacifichem2005, Honolulu, Hawaii, USA (December 15-20, 2005).
- "Probing adsorption and conformational change of interfacial proteins with total internal reflection spectroscopy," in Pacifichem2005, Honolulu, Hawaii, USA (December 15-20, 2005).
- "Solid phase extraction and elution on diamond (SPEED): A fast and general method for proteome analysis with mass spectrometry," in 8th Asian Conference on Analytical Sciences, Taipei, Taiwan (October 16-20, 2005).
- "Characterization of noncovalent biomolecular complexes in an ion cyclotron resonance cell with infrared spectroscopy," in 11th Asian Chemical Congress (ACC), Seoul, Korea (August 24-26, 2005).
- "Studies of protonated water clusters: From 2-mers to 21-mers," in Gordon Research Conferences on Molecular & Ionic Clusters, Aussois, France (September 5-10, 2004).
- "Measuring masses of single *Escherichia coli* K-12 whole cells in vacuo," in 52nd Annual ASMS Conference on Mass Spectrometry and Allied Topics, Nashville, Tennessee, USA (May 22-27, 2004).
- "Studies of molecular cluster ions: From hydrated protons to protonated biomolecules in the gas phase," in Royal Australian Chemical Institute (RACI) Conference on Physical Chemistry 2004, Hobart, Australia (February 1-5, 2004).
- "Competitive proton salvation between CH_3OH and H_2O in protonated mixed methanol-water clusters," in XXIst International Conference on Photochemistry (ICP21), Nara, Japan (July 26-31, 2003).
- "Hydrogenated diamond nanoparticles in space," in Fifth Asian International Seminar on Atomic and Molecular Physics, Nara, Japan (October 2-5, 2002).
- "Laser-induced fluorescence ion trap mass spectrometry of nanoparticles," in Institut fuer Physik, Technische Universitaet Chemnitz, Germany (August 19, 2002).
- "Infrared spectroscopy and mass spectrometry of nanodiamonds," in Institut fuer Physik, Technische Universitaet Chemnitz, Germany (August 16, 2002).
- "Ionic clusters," Discussion leader in Gordon Research Conferences on Molecular and Ionic Clusters, Ventura, California, USA (January 6-11, 2002).
- "Model studies of partial hydration of protonated peptides in the gas phase by infrared spectroscopy and ab initio calculations," in Gordon Research Conferences on Biological Molecules in the Gas Phase, New London, Connecticut, USA (June 10-15, 2001).
- "Hydrogen bond rearrangement dynamics of cluster ions containing an excess proton," in the Third Joint Meeting of Chinese Physicists World-Wide, Hong Kong (July 31 - August 4, 2000).
- "Hydrogen bond rearrangement and intermolecular proton transfer in protonated water clusters," in Gordon Research Conferences on Gaseous Ions: Structures, Energetics, and Reactions, Ventura, California, USA (February 28 - March 5, 1999).
- "Hydrogen bond rearrangement and solvation-induced proton transfer in protonated molecular clusters," in Research Workshop of the Israel Science Foundation: Proton Solvation and Proton Mobility, Neve Ilan, Israel (October 18-22, 1998).

- "Structure, isomeric transition, hydrogen bond rearrangement and solvation-induced proton transfer in protonated cluster ions," in Institut fuer Physikalische und Theoretische Chemie, Technische Universitaet Muenchen, Germany (July 16, 1998).
- "Structure, isomeric transition and proton transfer in protonated molecular clusters," in Institut fuer Physik, Technische Universitaet Chemnitz, Germany (July 15, 1998).
- "Spectroscopy, energy flow and chemistry of adsorbates on dielectric single crystal surfaces," in Institut fuer Physik, Technische Universitaet Chemnitz, Germany (July 10, 1998).
- "The structures and clustering kinetics of isomeric $NH_4^+(H_2O)_{3-6}$ in a free jet expansion: From single to double rings," in Symposium on Frontiers of Chemistry, the Second Conference for Worldwide Chinese Young Chemists, Kowloon, Hong Kong (December 20-23, 1997).
- "Infrared spectroscopic studies of vibrational relaxation and hydrogen etching on diamond single and nanocrystal surfaces," in The Second Joint Meeting of the World-Wide Chinese Physicists in Honor of Prof. Ta-Yu Wu on the Occasion of His 90th Birthday, Taipei, Taiwan (August 11-15, 1997).
- "High overtone spectroscopy and photodissociation of molecular complexes," in Department of Chemistry, Indiana University, Bloomington, IN, USA (February 11, 1994).
- "High overtone spectroscopy and photodissociation of molecular complexes," in Department of Chemistry, Harvard University, Cambridge, MA, USA (February 3, 1994).

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  More than 30 students: Shan-Jen Kuo *et al*.