Mohsen Vafaee – Curriculum Vitae

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Personal Born on Jun 27, 1973 in Isfahan, Iran

Iranian citizen

University education

1992 - 1996 Bachelor of Science in Chemistry

University of Isfahan, Isfahan 81744, Islamic Republic of Iran

1996 - 1999 Master of Science (MSC) in Physical Chemistry

with the Thesis Title:

"*Quantum corrections of kinetical equations at moderate intensities*"

Supervisor: Prof. A. Maghari

University of Tehran, Tehran, Islamic Republic of Iran

1999 - 2004 Doctor of Philosophy (PhD) in Physical Chemistry

with the Thesis Title:

"*Investigation of ultrashort intense laser field effect on simple systems such as* H_2^+ *and* D_2^+*"*

Supervisor: Dr. Hassan Sabzyan

Tarbiat Modares University, Tehran 14115-175, I. R. Iran

Awards

1996 The first rank in the national entrance examination of MSC of universities of I. R. Iran

1996 The second rank of chemistry in the first student's Olympiad examination of I. R. Iran

INTERESTS

- Electron and nucleus dynamics of atoms and molecules in ultra-short intense laser field
- Quantum optics, ultra-short science
- Theoretical femtosecond physics: atoms and molecules in strong laser fields
- Theoretical and numerical study of time-dependent Schrödinger equation
- Parallel computing and building cluster

Publications

1. Mohsen Vafaee, Hassan Sabzyan

"A detailed and precise study of the ionization rates of H_2^+ in intense laser fields", Journal of Physics B: Atomic, Molecular and Optical Physics, **37**, 4143-4157 (2004).

2. Hassan Sabzyan, Mohsen Vafaee

"Intensity dependence of the H_2^+ ionization rates in Ti:sapphire laser fields above Coulomb explosion threshold",

Physical Review A, 71, 063404 (2005),

republication in Virtual Journal of Ultrafast Science 4, issue 7 (2005).

3. Mohsen Vafaee, Hassan Sabzyan, Zahra Vafaee, Ali Katanforoush

"Instantaneous ionization rate of H_2^+ in intense laser field; Interpretation of the Enhanced Ionization",

http://arxiv.org/physics/0509072.

4. Mohsen Vafaee, Hassan Sabzyan, Zahra Vafaee, Ali Katanforoush

"Detailed instantaneous ionization rate of H_2^+ in intense laser field",

Physical Review A, 74, 043416 (2006),

5. Mohsen Vafaee, Hassan Sabzyan

"Reply to "Comment on 'Detailed instantaneous ionization rate of H_2^+ in intense laser field' "",

Physical Review A, 76, 067402 (2007),

6. Mohsen Vafaee

"Nuclear kinetic energy spectra of D_2^+ in intense laser field: Beyond Born Oppenheimer approximation",

Physical Review A, 78, 023410 (2008),

7. Mohsen Vafaee, Babak Shokri

"Pathway of D^+ in Sequential Double Ionization of D_2 in Intense Laser Pulse", Physical Review A, 81, 053408 (2010),

8. Firoozeh Sami, Mohsen Vafaee, Babak Shokri

"Nuclear classical dynamics of H_2 in an intense laser field",

Journal Physics B, 44, 16560, 2011,

9. M Vafaee, F Sami, B Shokri, B Buzari, H Sabzyan

"Precise Calculation of Single and Double Ionization of Hydrogen

Molecule in Intense Laser Pulses",

The Journal of Chemical Physics 137, 044112, 2012.

10. M Vafaee, F Sami, B Shokri, B Buzari, H Sabzyan

"Mapping electron dynamics in molecular H_2 using high-order-harmonic-generation time profiles",

Physical Review A 85 (3), 033407, 2012.

11. B Buzari, M Vafaee, H Sabzyan

"High harmonic generation from pre-ionized H_2 in ultrashort intense laser fields",

J. Phys. B: At. Mol. Opt. Phys. (46), 245401, 2013.

12. H Sabzyan, S. H. Ahmadi, M Vafaee,

"High-order harmonic generation of H_2^+ in superintense xuv ultrashort laser pulses",
J. Phys. B: At. Mol. Opt. Phys. (47), 105601, 2014.

13. H. Ahmadi, A. Maghari, H. Sabzyan, A. R. Niknam, and M. Vafaee
"Effect of nuclear motion on high-order-harmonic generation of H_2^+ in intense ultrashort laser pulses",
Physical Review A 90 (4), 043411, 2014.

14. M. Eidi, M. Vafaee, A. R. Niknam, N. Morshedian

"A new version of fermion coupled coherent states method: Theory and applications in simulation of two-electron systems",

arXiv:1510.06267.

15. H. Ahmadi, A. Maghari, and M. Vafaee
"Complicated high-order harmonic generation due to the falling edge of a trapezoidal laser pulse",

Journal of Physics B: Atomic, Molecular and Optical Physics 49 (3), 035602, 2016.

16. H. Ahmadi, A. Maghari, and M. Vafaee
"Even-harmonic generation due to spatially asymmetric emission",

arXiv:1603.00767.

Oral and Poster Presentations

1) "H_2^+ and D_2^+ molecular ions in ultrashort intense laser fields", Mohsen Vafaee and Hassan Sabzyan, *The 3rd SESAME Users' Meeting*, 2004, 11-13 October, Antalya TURKEY.

2) "Calculation of the ionization rates of H_2^+ in intense laser fields", Hassan Sabzyan and Mohsen Vafaee, *The 7th Physical Chemistry Seminar*, Iran, 2004.

3) "Ionization rates of H_2^+ in the laser fields above Coulomb explosion threshold", Mohsen Vafaee and Hassan Sabzyan, *The 8th Physical Chemistry Seminar*, Iran, 8-10 March 2005.

۴) " سرعت یونش لحظه ای H_2^+ در میدان شدید لیزر"، محسن وفایی، حسن سبزیان، زهرا وفایی و علی کتانفروش، دوازدهمین کنفرانس انجمن اپتیک و فوتونیک ایران، ۱۱-۱۳ بهمن ماه ۱۳۸۴.

۵) "لیزر های تپی فروکوتاه و کاربردهای آن"، حسن سبزیان و محسن وفایی، دوازدهمین کنفرانس انجمن اپتیک و فوتونیک ایران، ۱۱-۱۳ بهمن ماه ۱۳۸۴.

6) "Instantaneous ionization rate of H_2^+ in intense laser field; Interpretation of the enhanced ionization", Mohsen Vafaee and Hassan Sabzyan, *The 9th Physical Chemistry Seminar*, Rasht, Iran, June 13-15, 2006.

7) "Rising time effects of ultrashort intense laser field on the enhanced ionization rate H_2^+", Hassan Sabzyan and Mohsen Vafaee, *The 10th Physical Chemistry Seminar*, Isfahan, Iran, June 21-24, 2007.

8) “Nuclear kinetic energy spectra of D_2^+ in intense laser field: Beyond Born Oppenheimer approximation”, Mohsen Vafaee, *The 11th Physical Chemistry Seminar*, Ardebil, Iran, June, 2008.

9) “Electron dynamics of H_2^+ in a half cycle of intense laser field”, Hassan Sabzyan and Mohsen Vafaee, *The 11th Physical Chemistry Seminar*, Ardebil, Iran, June, 2008.

۱۰) " H_2^+ در میدان فمتوثانیه شدید لیزر به روش نیمه کلاسیکی: بررسی اثرات طول دوره تپ لیزر"، محمد حسن میرزایی و محسن وفایی، پانزدهمین کنفرانس انجمن اپتیک و فوتونیک ایران، دانشگاه اصفهان، بهمن ماه ۱۳۸۷.

11) “1s-2p resonance Rabi oscillation of Hydrogen atom in intense laser fiel”, Behnaz Bouzari and Mohsen Vafaee, *The 12th Physical Chemistry Seminar*, Sanandaj, Iran, 2009.

۱۲) " مسیر یون D^+ با انرژی جنبشی بالا در یونش دوگانه و متوالی D_2 در تپ شدید لیزر "، محسن وفایی و بابک شکری، شانزدهمین کنفرانس انجمن اپتیک و فوتونیک ایران، دانشگاه یزد، بهمن ماه ۱۳۸۸.

۱۳) " دینامیک کوانتمی الکترون و دینامیک کلاسیک هسته‌ای در معرض تابش میدان لیزر فروکوتاه شدید" فیروزه سامی، محسن وفایی و بابک شکری، کنفرانس فیزیک ایران، دانشگاه همدان، شهریور ماه ۱۳۸۹.

۱۴) "شبه‌حالت‌های گذار ناشی ازیونش دوگانه (متوالی و همزمان) H_2 در میدان شدید فروکوتاه لیزر"، بهناز بوذری، حسن سبزیان و محسن وفایی، شانزدهمین کنفرانس انجمن اپتیک و فوتونیک ایران، دانشگاه کرمان، بهمن ماه ۱۳۸۹.

۱۵) " دینامیک وابسته به زمان سیستم برهمکنشی H_2 – میدان شدید فرو کوتاه لیزر بر اساس طیف هماهنگ‌های مرتبه بالا"، بهناز بوذری، حسن سبزیان و محسن وفایی، شانزدهمین کنفرانس انجمن اپتیک و فوتونیک ایران، دانشگاه کرمان، بهمن ماه ۱۳۸۹.

۱۶) " تحول بسته موج الکترون آزاد به تابع موج الکترون مقید "، حسن سبزیان، فاطمه علوی و محسن وفایی، شانزدهمین کنفرانس انجمن اپتیک و فوتونیک ایران، دانشگاه کرمان، بهمن ماه ۱۳۸۹.

17) “Covalent and ionic doorway states of H_2 in ultrashort intense laser field”, Mohsen Vafaee, Hassan Sabzyan, Behnaz Buzari, *14th Iranian Physical Chemistry Conference*, University of Tehran, Kish, Iran, February 25-28, 2011.

18) “Evolution of the free electron wavepacket into bound electron wave function”, H. Sabzyan, S. F. Alavi, M. Vafaee, *14th Iranian Physical Chemistry Conference*, University of Tehran, Kish, Iran, February 25-28, 2011.

19) “High-order harmonic generation of H_2^+ in intense ultrashort laser pulses”, S. H. Ahmadi, A. Maghari, H. Sabzyan, M. Vafaee, *16th Iranian Physical Chemistry Conference*, University of Mazandaran, Babolsar, Iran, February 29-31, 2013.

20) “Numerical calculation of the Hydrogen molecule ground state using coherent states”, M. Eidi, A. R. Niknam , M. Vafaee, *16th Iranian Physical Chemistry Conference*, University of Mazandaran, Babolsar, Iran, February 29-31, 2013.

۲۱) "تولید هماهنگ مرتبه بالا در سامانه H_2^+ تحت تپ‌های لیزری شدید فوق‌کوتاه: ورای تقریب بورن-اپنهایمر "، سید حامد احمدی، علی مقاری، حسن سبزیان، محسن وفایی، و علی‌رضا نیکنام، سومین کنفرانس لیزر و کاربردهای آن، دانشگاه تربیت مدرس، شهریور ۱۳۹۳.

22) “Correlated Nuclear and Electronic Motions on High-Order Harmonic Generation of H_2^+”, H. Ahmadi a , A. Maghari a , H. Sabzyan b , A. R. Niknam and M. Vafaee , *16th Iranian Physical Chemistry Conference, K.N.Toosi University of Technology*, Tehran, Iran, October 21-24, 2013.

23) “Interaction of ultrashort intense laser pulse with atoms and molecules”, M. Vafaee (Invited Speaker), *Fourth Theoretical and Computational Chemistry Workshop and Seminar*, Chemistry and Chemical Engineering Research Center of Iran (CCERCI), Tehran, Iran, January 28-29, 2015.

Research Projects and Contracts

Pathway of Dissociation-Ionization of D_2^+ in Intense Laser Pulse, 2008-2010

Other Professional Activities, Experiences and Membership

Assistant Professor in University of Isfahan 2005-2008
Postdoc researcher in Laser-Plasma Research Institute, Shahid Beheshti University 2008-
Member of Optics and Photonics Society of IRAN
Member of the Iranian Chemical Society

Teaching Graduate Courses

Quantum mechanics
Atoms and molecules
Advanced Quantum chemistry I
Advanced Quantum chemistry II
Molecular Spectroscopy II

Teaching Undergraduate Courses

Quantum chemistry
Physical Chemistry I
Chemistry I

Acted as referee for:

Physical Review A. Atomic, Molecular, and Optical Physics Published by Institute of Physics in USA
Journal of the Iranian Chemical Society Published by Iran's chemistry Association

Graduate Students

Number of the students in past or presently under supervision or co-supervision

PhD: 3 MSc: 12

Students Thesis

The prepared or in preparation PhD or MSc thesis as supervisor or advisor:

1. *Investigation of interaction of hydrogen molecule ion under femto second intense laser field by semiclassical method.* (Msc Thesis) M. Mirzaie, 2008, Supervisor.
2. *The solution for the Time Depenent Schrodinger Equation of the H_2 under irradiation of the high intensity ultrashort laser pulses.* (Msc Thesis) F. Sami, 2010, Advisor.
3. *Time-dependent evolution of two electronic systems in ultra-short intense laser pulse.* (PHD Thesis) B. Buzari, 2012, Supervisor.
4. *Control of the states in nanostructures through quantum Zeno effect.* (Msc Thesis) F. Farzam, Advisor.
5. *Quantum optics of nanostructures in attosecond scales: fundamental theory and experiment.* (Msc Thesis) A. Allahy, 2011, Advisor.
6. *Evolution of the Two-Dimentional electron and nuclear wavepackets under magnetic and electric fields of ultrashort intense laser pulse.* (Msc Thesis) H. Ahmadi, 2011, Advisor.
7. *Evolution of free electron wavepacket to bound electron wavefunction* (Msc Thesis) Alavee, 2011, Advisor.
8. *Investigation of high- order harmonic generation of H_2^+ under ultrashort intense laser pulses.* (PHD Thesis) H. Ahmadi, 2014-20xx, Supervisor.
9. (PHD Thesis) A. Ebadati, 2014-20xx, Advisor.
10. *Simulation of two electronic systems using coupled coherent states approach in the phase space.* (Msc Thesis) M. Eidi, 2014, Advisor
11. *Simulation of Quantum Dynamics of Multi-Dimensional Systems with Coupled Coherent States.* (Msc Thesis) Dolati, 2014, Advisor
12. *Investigation on principles time-dependent density functional theory and its application to H_2 in intense laser field.* (Msc Thesis) A. Beshartnic, 2014-20xx, Supervisor.

13. *Investigation of Hydrogen molcular system in the ultra short intense laser field using coupled coherent state.* (Msc Thesis) M. Roien, 2014-20xx, Advisor.

14. *Effect of wavelength of ultra-short intense laser pulses on the high-order harmonic spectrum of* H_2^+. (Msc Thesis) H. Taghipour, 2014-20xx, Supervisor.

15. *A theoretical study of phosgene gas adsorption on graphene and doped graphene.* (Msc Thesis) M. Zare, 2014-20xx, Supervisor.

References

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