

CHAMPAK KHURMI

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Education:

University of South Carolina, Ph. D. in Chemistry (Nov. 2009)
Panjab University, India, M. Sc. (Honors), Theoretical Chemistry, 2004.
Panjab University, India, B. Sc. (Honors), Chemistry, 2002.

Skills:

- Operation and troubleshooting of ultrafast laser systems including Ti:Sapphire, Nd:YAG, Nd:YLF.
- Optical system design and alignment.
- Vacuum chamber design and operation of beam line under vacuum.
- Time resolved multidimensional spectroscopy to study excited state dynamics.
- Time resolved photoelectron spectroscopy in the VUV-XUV domain.

Research Accomplishments:

Postdoctoral Research (Lawrence Berkeley National Lab, Dec. 2009 - Dec. 2011)

- Setup the optical spectroscopy lab for pump-probe experiments using VUV-XUV radiation
- Perform time resolved photoelectron spectroscopy experiments on ethylene (a prototypical double bond) and O₂

Ph. D. Research (Advisor: Prof. Mark Berg, 2004-2009)

Title: "Distinguishing homogeneous and heterogeneous origins of nonexponential dynamics using Multiple Population Period Transient Spectroscopy (MUPPETS)"

- Developed a new spectroscopic technique (MUPPETS) based on a sequence of six ultrafast phase controlled optical pulses using diffractive optics
- Demonstrated that this technique can distinguish between homogeneous or heterogeneous origins of nonexponential dynamics and applied this technique to explore dynamic heterogeneity in an Ionic Liquid
- Applied inverse laplace transform to explore the connections between MUPPETS and existing multiple-pulse techniques

M. S. Research (Advisor: Prof. Harjinder Singh, 2002-2004)

Title: "Probing a relationship between molecular geometry and bulk dielectric constant"

- Investigated the effects of molecular geometry on dipole moment using molecular mechanics and *ab-initio* methods
- Derived the Mulliken and Walsh (MW) diagram for water molecule using *ab-initio* calculations

Research Publications:

1. van Veldhoven, E.; **Khurmi, C.**; Zhang, X.; Berg, M. A., “*Time-Resolved Optical Spectroscopy with Multiple Population Dimensions: A General Method for Resolving Dynamic Heterogeneity*”, *ChemPhysChem* **2007**, 8, 1761-65.
2. **Khurmi, C.**; van Veldhoven, E.; Zhang, X.; Berg, M. A., “*Multidimensional Population “Echo” Distinguishes Between Homogeneous and Heterogeneous Dynamics* ” In *Ultrafast Phenomena XV*; Corkum, P., Jonas, D., Miller, R. J. D., Weiner, A. M., Eds.; Springer Series in Chemical Physics; Springer-Verlag: Berlin, **2007**, 88, 329-31.
3. **Khurmi, C.**, Berg, M. A., “*Analyzing Nonexponential Kinetics with Multiple Population Period Transient Spectroscopy (MUPPETS)*”, *J. Phys. Chem. A* **2008**, 112, 3364-75.
4. **Khurmi, C.**, Berg, M. A., “*Parallels Between Multiple Population-Period Transient Spectroscopy (MUPPETS) and Multidimensional Coherence Spectroscopies*”, *J. Chem. Phys.*, **2008**, 129, 064504.
5. **Khurmi, C.**, Berg, M. A., “*Differential Heterodyne Detection with Diffractive Optics for Multidimensional Transient Grating Spectroscopy*”, *J. Optical Soc. America B* **2009**, 26 (12), 2357-62.
6. **Khurmi, C.**, Berg, M. A., “*Rate Heterogeneity in an Ionic Liquid*”, *J. Phys. Chem. Letters*, **2010**, 1, 161-64.
7. **Khurmi, C.**, Berg, M. A., “*Separating Sub-Ensembles on Ultrafast Timescale: Multiple Population Period Transient Spectroscopy (MUPPETS)*”, In *Ultrafast Phenomenon XVII* (2010), paper ThE12.
8. Allison, T., Travis, W., Stooke, A., **Khurmi, C.**, Tilborg, J., Liu, Y., Falcone, R., Belkacem, A., “*Femtosecond Dynamics of Small Molecules Excited Studied with Vacuum-Ultraviolet Pulse Pairs*”, In *Ultrafast Phenomenon XVII* (2010), paper WB6.
9. Allison, T., Travis, W., Stooke, A., **Khurmi, C.**, Tilborg, J., Liu, Y., Falcone, R., Belkacem, A., “*Femtosecond Spectroscopy with Vacuum-Ultraviolet Pulse Pairs*”, *Optics Letters* (2010), 35 (21), 3664-3666.

Research Presentations:

1. Khurmi, C., van Veldhoven, E., Zhang, X.; Berg, M. A., “*Resolving Heterogeneous and Homogeneous Mechanisms for Nonexponential Kinetics using 2D Transient Grating Spectroscopy*”, 58th Southeast Regional Meeting of the American Chemical Society Augusta, GA, United States, November 1-4 (2006).
2. Khurmi, C., Berg, M. A., “*Probing Heterogeneous Dynamics in an Ionic Liquid using MUPPETS* ”, 236th National Meeting of the American Chemical Society Philadelphia, PA, United States, August 17-21 (2008).
3. Khurmi, C., Berg, M. A., “*Multiple Population Period Transient Spectroscopy*”, Lawrence Berkeley National Lab, May 2010.