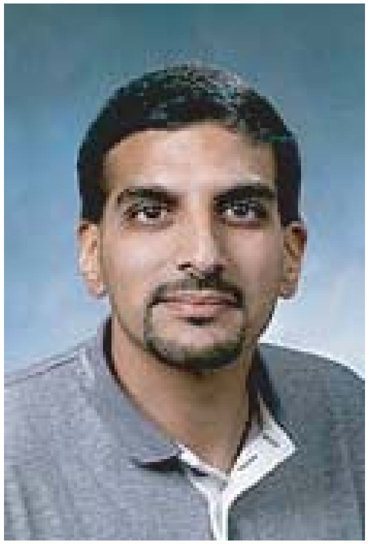
The Institute of OPTICS

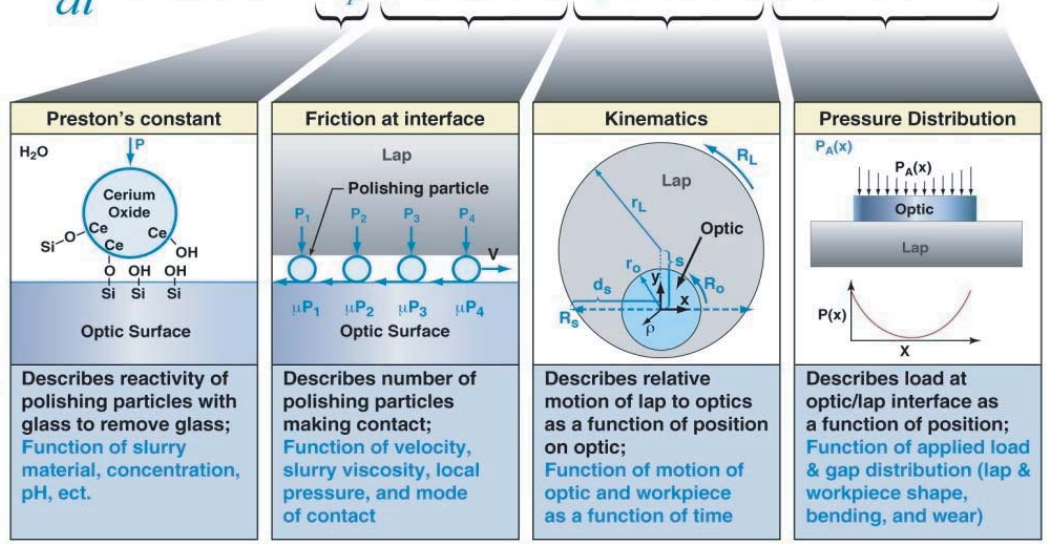
Colloquium

UNIVERSITY of ROCHESTER

Contributions of kinematics and pressure distribution on the surface figure during polishing of fused silica



$$\frac{dh}{dt}(x,y,t) = k_p \, \mu(x,y,t) \, v_r(x,y,t) \, p(x,y,z,t)$$



Dr. Tayyab I. Suratwala

Lawrence Livermore National Laboratory
Associate Program Manager, NIF
Laser Materials and Optics Technology,
Chemical Sciences Division

B.S. U. Illinois U-C, 1992
PhD, U. Arizona, 1996
Argonne N.L. 1990-92
LLNL, 1997-

The lecture will describe an effort to develop a scientific understanding of material removal which is a critical step in achieving the ability to deterministically finish an optical surface using full aperture polishing for achieving the desired surface figure in a more repeatable, less iterative, and more economical manner.

3:00 pm, Monday, March 23, 2009
Sloan Auditorium, Goergen Building
Refreshments provided

Co-sponsored by
Department of Mechanical Engineering

Contributions of Kinematics and Pressure Distribution on the Surface Figure during Polishing of Fused Silica

Tayyab I. Suratwala, Mike Feit, Rusty Steele
Lawrence Livermore National Laboratory

The ability to deterministically finish an optical surface using full aperture polishing would allow for achieving the desired surface figure in a more repeatable, less iterative, and more economical manner. Developing a scientific understanding of material removal is a critical
step in accomplishing this; this is the focus of the present study. The optical surface figure and material removal during polishing of fused silica plates on a polyurethane pad using a ceria-based slurry has been measured as a function of time, kinematics, and loading conditions. Using this collected data, a positional and time dependent Preston's model for material removal has been developed and validated, where the surface figure is largely determined by the relative velocity distribution and pressure distribution between the optic and lap. The key features of this model include: 1) vector–based determination of the relative velocity distribution; 2) moment force contribution to the pressure distribution; 3) lap material viscoelastic relaxation and its contributions to the pressure distribution; and 4) physical mismatch between the optic/lap and its contribution to the pressure distribution.

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Tayyab I. Suratwala
Associate Program Manager, NIF
Laser Materials and Optics Technology,
Chemical Sciences Division

Education and Professional Experience

B.S., Ceramic Engineering, University of Illinois Urbana-Champaign, 1992.
Ph.D., Materials Science and Engineering, University of Arizona, 1996.
LLNL: Associate Program Manager, NIF, Laser Materials and Optics Technology, 2006–present; Glass Optics Group Leader, 2004–06; Yield Improvement Group Leader, 2001–04; Laser Glass Research and Yield Improvement Group Leader, 1997–01
Argonne National Laboratory: research associate, 1990–92.

Research Interests

Glass grinding and polishing, laser damage in optics, fracture behavior in glasses, slow crack growth, glass chemistry, optical properties of glasses, and sol-gel chemistry.